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Questions, queries and facts: A semantics and pragmatics for interrogatives

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QUESTIONS, QUERIES AND FACTS: A SEMANTICS AND PRAGMATICS FOR INTERROGATIVES

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By
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March 1992

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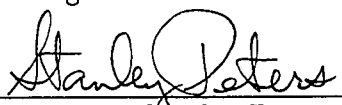

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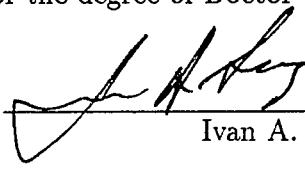

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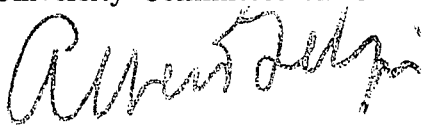

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Abstract

This work concerns itself with characterising the different types of contents that arise from uses of interrogative sentences, describing what meanings get associated with particular interrogative sentences, and explaining how these get put together compositionally on the basis of the meaning of their constituents, with particular attention to the meaning of interrogative phrases.

Within most recent work in linguistic semantics, questions, the contents of query uses of interrogatives, have been analysed reductively as higher order propositional objects. The current work argues against such an analysis. In its stead a view of questions is offered wherein these constitute the subclass of singular propositional entities, *unresolved* states-of-affairs (SOA's), that contain one or more intrinsic informational *voids*, characterised technically as argument roles of the propositional entity with whom no entity is associated. This view provides for an inherently richer notion of *answerhood* that is at the same time based on entities that are more plausibly available to cognitive agents engaged in querying. The need for a richer notion of answerhood is prompted by our demonstration that the class of answers to any given question — contents that can be conveyed by acceptable responses — has been considerably *under*-recognized in past work.

Moreover, the current approach provides a natural way to capture a systematic ambiguity manifested by embedded interrogative sentences. One class of meanings, provides for *unresolved* states-of-affairs, which as well as being query objects, are embedded by a class of predicates that includes the verbs *ask*, *wonder* and *investigate*. The other class of meanings ('RI meaning') provides for factual, *resolved* states-of-affairs that are embedded by such predicates as *tell*, *know* and *guess*.

An important gain made by the proposed approach to the two types of interrogative meaning is that it reveals systematic and cross-linguistically stable contrasts in the ability of a predicate to to take an RI meaning as an argument. These have appeared to be *idiosyncratic* on previous views of sentential interrogative meaning. The account we offer, building on insights of Vendler, will argue that two propositional notions, *states-of-affairs* on the one hand, and *claims* on the other, need to be distinguished. We will show that a simple modelling for this conceptual distinction can be given, using logical tools from situation theory, as well as demonstrating that it partitions the class of propositional complement predicates. In particular, there emerges a class of predicates applicable only to claim-like entities and hence inapplicable to the RI meaning.

Our proposal for characterising the meaning of interrogative expressions is based on data indicating that there exist three classes of uses which interrogative phrases can undergo, which we dub *independent* (roughly 'wide scope'), *dependent* (roughly including 'narrow scope' and 'functional') and *reprise* (including 'echo' questions) uses. Our basic claim will be that for any given interrogative form, the differences between the contents each of the uses give rise to cannot be reduced to differing scope relations bourne by (the semantic contribution of) the constituent interrogative phrase to (the semantic contributions of) other constituents of that form. Nor can these differences be reduced, we claim, to lexical ambiguities at an abstract level of logical form.

Consequently, we argue extensively against an assumption common to most past work that interrogatives should be viewed as quantifiers on either syntactic or semantic grounds. We assume meanings are assigned to syntactic expressions represented syntactically at a surface level in combination with a storage mechanism for treating scopal ambiguities. The semantic framework we will use for meaning representation will be the situation semantics framework of Gawron and Peters 1990a, while the syntactic framework will be the HPSG framework of Pollard and Sag 1992.

Interrogative phrase meaning is argued to derive from two components: the one component is a variable contributed by any interrogative phrase that acts as a place holder in an argument role associated with an interrogative phrase use, and provides

additional restrictions on the argument role. The other is an indication of the sentential level at which the variable is input to a closure operation, dubbed α-closure, which we define. This closure operates at a sentential level, and, we will argue, scopes just wider than quantificational closure. In the case of *independent* uses of interrogative phrases, the effect of α-closure is to create an unresolved SOA, whose main relation is obtained by abstracting over any variables filling argument roles associated with (independent) interrogative uses and whose argument role(s) are unresolved.

We argue that dependent and reprise uses of *interrogative* expressions are each particular instances of use-types applicable to non-interrogative expressions. Dependent uses include bound variable anaphora as an instance. Reprise uses comprehend quotative uses of declarative sentences. We show how combining the general characteristics of each use type with the characterisation of independent interrogative uses sketched above enables the defining conditions pertaining to these additional interrogative uses to be derived. This allows for a simple and comprehensive account of the available interrogative meanings.

Acknowledgements

Arguably the most important lesson I have learnt during my graduate career concerns acknowledgements: an avid reader of acknowledgements in my early years, I was constantly perplexed at the frequent references in them to last minute completions of dissertations. No more.

That this dissertation and the work it describes exist I owe to the varied help, support, encouragement and advice received from many. Stanley Peters, my adviser, has always been open to listen to and discuss my ideas, many of them at a less than half-baked stage. His encouragement and stimulation lead to the cultivation of the more productive among them. I would like to thank Ivan Sag for many highly useful conversations and encouragement, not least for extensive help at crucial stages when time was in such short supply. Joan Bresnan and Sandro Zucchi read drafts of the dissertation at short notice and provided many valuable suggestions. I would also like to thank John Perry for a number of stimulating discussions and for proposing one avenue of research in particular that proved rewarding. Edit Doron and Craige Roberts provided me with much help and insight during the early stages of my involvement with linguistics.

Aaron, Lubna, Hadar, Paul and Xaggai have, in particular, been linguistic and non-linguistic, semantic and non-semantic companions over my stay here. Thanks to them and all the others for a lot.

To my family: my parents, my sister, and my grandparents.

Contents

Chapter 1

On the Contents of Interrogatives

1.1 Introduction

Interrogative sentences can occur either as independent sentences or embedded as complements of a predicate. The central aim of this dissertation is to assign meanings to interrogative sentences on the basis of which verbal behaviour associated with these sentences can be explained. In the independent case the most prominent behaviour patterns concern the differential acceptability of responses to queries using interrogative sentences. In the case of embedded uses, the data originates from a number of inference and distribution patterns that interrogative complements exhibit.

The central use made of independent interrogative sentences is interrogatory, to make *queries*. The defining characteristic of a query is that it elicits *responses* the felicity of which is, roughly, determined by the content of the query. This raises two questions:

- What is it about the meanings of interrogative sentences that makes them appropriate to be used as objects of querying?
- What are the principles determining the felicity of a response to a query in a particular context of use?

Interrogative sentences also have non-interrogatory uses. In certain somewhat

restricted contexts, for instance, they can be used indirectly to assert. This raises the following issue which partially subsumes the previous two:

- What is the relation between the discourse context and the uses interrogative sentences can be put to?

Resolving this issue turns out to have implications for various assumptions concerning the relation between the syntax and meaning of interrogative sentences, in particular the putative link between wh-movement and semantic scope relations.

With regards to occurrences of interrogative sentences as complements of predicates similar issues arise:

- What, if any, are the semantic principles that determine whether a given predicate can embed an interrogative sentence?
- What inference patterns involving embedded interrogative complements are predictable solely on the basis of the meanings of the complements?
- Do all interrogative complements give rise to the same inference patterns, and if not, why?

Our aim, then, is to provide an account that can resolve the issues raised above. Of course, what counts as a resolution is highly dependent on various background assumptions concerning linguistic and semantic theory. One of the main assumptions of the current work is, crudely put, that meanings concern the use of linguistic expressions to achieve certain effects. At a minimum, then, explanatory adequacy consists in providing an account that avoids implausible assumptions both about the structure of linguistic expressions and about the conditions under which these expressions get used. One specific explanatory desideratum concerning interrogative sentences is the following:

- The contents posited for uses of interrogative sentences are not cognitively implausible as objects of querying. That is, given the characteristics of a context in which a query takes place, the posited content is plausibly accessible to a querier.

One of the claims of the current work is that various past proposed semantics for interrogatives fail to meet this desideratum.

The current chapter through chapter 3 are concerned with characterising the contents of uses of interrogative sentences, leaving to chapters 4-6 the issue of specific meanings attached to interrogative sentences, and how these get put together compositionally. A number of issues pertaining exclusively to the semantics of *embedded* interrogative sentences form the topic of chapter 7.

In the current chapter we provide the data which we claim characterises the contents of uses of interrogative sentences. We initially attempt to demonstrate the following: in order to explain the patterns of acceptability of responses to queries across different contexts of use, one has to recognize the existence of a context independent relation of *answerhood* relating (semantic) contents. For any interrogative sentence, this relation holds between the descriptive content of a query that uses the sentence and a class of propositional objects. It is these objects that acceptable responses to a query can convey, either directly or via pragmatic inference.

One of our main claims in the empirical domain will be that the class of answers — contents that can be conveyed by acceptable responses — has been quite considerably *under*-recognized in past work. The main reason for this has been the failure to distinguish between two notions: *an* answer, the content conveyed directly or indirectly via pragmatic inference, by an acceptable response to a query, and *a resolving* answer, roughly, an answer that is both factual and exhaustive. Although queries are frequently made with the intent of eliciting a resolving answer, this is a defeasible tendency. Moreover, even when this intent is manifest, responses that do not provide resolving answers, either in terms of factuality or exhaustiveness, are not viewed as *incorrect* linguistic behaviour, rather they are viewed as uncooperative.

The main reason for the conflation would appear to come from the domain of embedded interrogative sentences: a class of interrogative complements provides data most readily explicable by assuming that they denote a propositional entity satisfying the property of being a resolving answer to the descriptive content of an interrogatory use of the sentence.

The second main empirical claim we make is that interrogative sentences are

systematically ambiguous: one class of meanings, denotation instances of which we shall call *questions*, provides for descriptive contents of queries, and is embedded by one class of predicates, including *ask*, *wonder* and *investigate*. The other class of meanings, instances of which we will call *resolving answers*, is embedded by such predicates as *tell*, *know* and *guess*.

Our claim, then, will be that the source for the assumption of the predominance of *resolving answers* as contents of acceptable responses to queries originates from the conflation of the two meanings. Apart from hampering the account of acceptable responses to queries, this conflation also makes for problems in explaining contrasts in inference patterns exhibited by interrogatives embedded by different predicates. Moreover, as we shall see, attempts to reductively characterise one meaning in terms of the other cannot go through, not least because the two meanings are individuated with equally fine grain.

Chapter 2 is devoted to an examination of past work in this domain: we examine two approaches, one views interrogatives, roughly, as unsaturated syntactic objects denoting relations, that get saturated by the responses they elicit. This approach can provide an adequate theory of answerhood but at an unacceptable price: no plausible definition of binary operations can apply to the proposed semantic objects, since interrogatives differing in the adicity and argument type of their constituent interrogative phrases denote objects of semantically different types. Moreover, the approach makes predictions about the mapping between syntactic and semantic categories that are either obviously false or require making unmotivated syntactic category distinctions.

The other approach we consider views an interrogative, roughly, as denoting the property of being a resolving answer to a query using the sentence. This approach does not run into the problem of uniformity. However, the theory of answerhood it provides is too restrictive. Question/answer embedded interrogative distinctions are either not made or predict that the question interrogatives are inherently individuated with finer grain: a prediction that is clearly refuted. Binary operations can be extended to interrogative sentences but only with the aid of various otherwise unmotivated type-shifting operations. The approach predicts that interrogatives are individuated no more finely than their instantiations, a prediction that is not supported by the

data. Finally, the proposed denotations face a serious construal problem as objects of querying, given the fact that in many cases a querier cannot be acquainted with the possible answers to the question. It is not clear how to resolve this latter problem without appealing to an underlying non-reductively construed open proposition which the answers are described as pertaining to.

So what do interrogative sentences denote? Jespersen had the following intuition about wh-interrogative sentences:

> '... we have an unknown 'quantity' exactly as in an algebraic equation; we may therefore use...the term x-question for a question aiming at finding out what x stands for.' (Jespersen 1965.)

This intuition encapsulates the basic fact about answerhood, namely that answers to a given interrogative sentence are instantiations of or, in certain cases, where the language has the means, quantifications over the open proposition associated with the interrogative. The task we undertake in chapter 3 is how to make semantic sense of a Jespersen's idea of an 'unknown quantity' associated with an argument role: we show that this can be done in a way that explicitly avoids using variables as semantic objects. This will provide a simple and adequate account of the denotations of uses of interrogative sentences, without foundering on issues of empirical adequacy such as coordination and individuation or explanatory adequacy such as categorical explosion or cognitive construal.

1.2 Independent interrogative sentences

1.2.1 Introduction

The data we provide in this section is intended to provide the defining characteristics of uses of independent interrogative sentences. Our main aim in this section is to establish the following:

The felicity of a response to a given query is determined in a rule governed way: speakers have solid intuitions about whether or not a response forms a

coherent discourse with a given query. This competence cannot be syntactically based since the felicity of a an expression used as a response to an interrogatory use of a given interrogative sentence can shift with context. Moreover certain non-linguistic acts can serve as appropriate responses. Conversely, these intuitions cannot simply be determined by pragmatic factors, since queries utilising distinct interrogative sentences that differ little in the pragmatic goal that motivates their asking can give rise to distinct response-felicity patterns. Moreover, response patterns to compound interrogative sentences appear to be predictable on the basis of the response patterns of their constituents and the meaning of the coordinating connective.

We also briefly consider assertoric uses of interrogatives: these provide initial evidence about the influence of the context on the possibility of using interrogatives to query.

1.2.2 Coherence of queries and responses

A central use a speaker of a natural language makes of an interrogative sentence is to *ask* it, that is to issue *a query* whose descriptive content is that question. Such speech acts are directive in force: typically, a speaker expects her addressee to respond to the query. Moreover, her using that particular sentence means that she desires a response whose content is strictly delimited. The data we provide is intended to establish that response felicity cannot be reduced to purely syntactic considerations or conversely to purely pragmatic considerations. The data we provide involves intuitive judgements about whether or not an utterance or other act intended as a response forms a coherent discourse with a given query.

Response felicity is not syntactically determined

We provide two types of data to establish that response felicity cannot be reduced to a syntactic relation between expressions. On the one hand, the context dependent nature of response felicity. On the other hand, the possibility of extra-linguistic acts to serve as appropriate responses.

The context dependence of response felicity

(1) a. (No particular information in the context.) Who committed the crime? # Look, my uncle does not work during weekends.

b. (It is known that the crime was committed on a Saturday. The addressee's uncle is a suspect.) Who committed the crime? Look, my uncle does not work during weekends.

(2) a. (No particular information in the context.) Who scored in the game last night? # Yes, *he* did.

b. (Interlocuters staring at a portrait of famous footballer, querier raises eyebrows towards picture.) Who scored in the game last night? Yes, *he* did.

Appropriate extra-linguistic responses to queries

(3) Who committed the crime? (Responder points at Mary).

(4) Are you happy? (Responder shakes head)

(5) (Addressee is required to persuade audience he is German.) Who are you? (Thick Bavarian accent:) *Kennst Du das Land wo die Zitronen blühen.* (Searle 1969)

1.2.3 Reducing response felicity to pragmatics

The current section makes the point that queries using distinct interrogative sentences but intended as requests for fulfillment of essentially equivalent pragmatic goals exhibit different patterns of response felicity. We provide two pairs of sentences which can plausibly be taken to be uttered as requests for the resolution of identical pragmatic goals, and show that the patterns of response felicity that emerge are quite distinct.

(6) a. Who left last night?

b. Bill did.

c. It's not known at present.

d. Many important people.

e. # Yes.

f. # I think so.

(7) a. Did anyone leave last night?

b. Yes.

c. Let's see. (pause) Bill did.

d. # Many important people.

(8) a. Is there any reason that could explain Jill's annoyance?

b. I don't believe she is annoyed.

c. Probably.

d. # Because Mary doesn't live here anymore.

e. # For an unknown reason.

(9) a. Why is Jill annoyed?

b. Because Mary doesn't live here anymore.

c. For an unknown reason.

d. # Probably.

1.2.4 Response patterns of compound interrogative sentences

Binary connectives such as 'and', 'or', 'if/then' etc. provide means of constructing compound interrogative sentences. The responses these compound sentences elicit is determined by the responses each of the constituents elicit and by the meaning of the connective. The following contrast between conjoined and disjoined interrogatives illustrates this:

(10) a. (Tell me:) Who left last night and is there any reason that could explain Jill's annoyance?

b. Bill left though I don't believe Jill is annoyed.

c. # Well I would guess that Jill's best friend left.

d. # Yes.

e. # I think so and for an unknown reason.

(11) a. (Tell me:) Who left last night or is there any reason that could explain Jill's annoyance?

b. Bill left though I don't believe Jill is annoyed.

c. Well I would guess that Jill's best friend left.

d. # Yes.

e. # John phoned me and Mary doesn't live here anymore.

Let us consider in detail how different connectives influence response patterns of a sentence which they coordinate.

AND

A felicitous response to a conjoined interrogative will provide either for a compound response containing felicitous responses for each conjunct, or a response generally applicable to any query.

(12) a. (Interlocuters staring at a portrait of famous footballer, querier raises eyebrows towards picture.) Who scored in the game last night and who was the best player on the field?

b. Yes, *he* did, but actually it was Strachan who was the best on the night.

(13) a. Who are you and do you understand any English?

b. (Addressee is required to persuade audience he is German.) (Thick Bavarian accent:) *Kennst Du das Land wo die Zitronen blühen.* A little bit.

c. (No particular information in the context.) # *Kennst Du das Land wo die Zitronen blühen.* It is 3 O'clock.

(14) a. Who does Bill like and when is he going to settle down?

b. Bill likes Jill. I believe he's going to settle down within a year or two.

c. I don't know about the first (part of the) question, but I do believe he's going to settle down within a year or two.

d. I think he likes Barry, but I haven't got any idea when he'll finally decide to settle down.

e. Tough question, couldn't tell you.

OR

A felicitous response to a disjoined interrogative will provide either for a compound response containing felicitous responses for each conjunct, or a simplex response felicitous as a response to one of the disjuncts or or a response generally applicable to any query:

(15) a. Who committed the crime or why was your uncle out of his office?

b. (No particular information in the context) Look, my uncle does not work during weekends, so it's quite usual for him to be away.

c. I would accuse Max Cosgrave.

d. I would accuse Max Cosgrave. Afterall my uncle does not work during weekends, so it's quite usual for him to be away.

(16) a. Who are you or do you understand any English?

b. (Addressee is required to persuade audience he is German.) (Thick Bavarian accent:) *Kennst Du das Land wo die Zitronen blühen.*

c. (Addressee is required to persuade audience he is German.) (Thick Bavarian accent:) A little bit.

d. (No particular information in the context.) # *Kennst Du das Land wo die Zitronen blühen.*

e. (No particular information in the context.) ?? It is 3 O'clock.

Things, however, are more intricate: not just any disjunction of questions seems to yield a compound question that can be used felicitously in queries:

(17) a. # Who does Mary like or when is Bill arriving?

b. # Why is Bill annoyed or is Jack an alcoholic?

The typical response an interrogatory use of either of the questions in (17) elicits would appear to be:

(18) Better make your mind up—which question do you want me to answer?

This suggests that in cases like (17), the disjunction is interpreted as a choice between queries, rather than as a compound query. In other words, for the disjunction to succeed as a propositional operation, some further restriction must be met, apparently that the two disjuncts are construable as specifying information that is mutually exclusive.

(19) a. Why is Bill annoyed or is it the case that he suffers from random facial seizures?

b. Why is Bill annoyed or is it the case that Jack is an alcoholic?

Thus, (19a) appears to be appreciably more felicitous as a query than (19b), plausibly because someone manifesting random facial seizures can exclude their being annoyed and vice versa, whereas (without the salience of specific contextual information) annoyance of one person does not seem to impinge on somebody else's being an alcoholic.

What, then, is the source for the 'exclusiveness condition'? If we have a definition of 'or' that is wide enough to include both questions and propositions, then the usual source of exclusiveness for propositional 'or', either a presupposition of some sort or a conversational implicature, can be invoked.

Conditionals

Conditionals can also be used to form compound interrogative sentences. There are restrictions of an apparently syntactic nature on this which severely restrict the use of conditional sentences where the antecedent is interrogative. Not wishing to enter into this issue in the current chapter, we restrict ourselves to cases where the antecedent is declarative and the consequent interrogative. Initially, the generalisation concerning response patterns of conditional interrogatives is that any responses applicable towards the consequent interrogative constituent are applicable to the whole conditional, though not vice versa:

(20) a. Who will be the leader of the New Zealand mutton lobby if Muldoon resigns?

b. Max Smith will be the leader of the New Zealand mutton lobby if Muldoon resigns.

c. Max Smith.

d. Some weird farmer no doubt.

e. # Yes

(21) a. Who will be the leader of the New Zealand mutton lobby?

b. Max Smith.

c. Some weird farmer no doubt.

d. # Yes

In the two cases where the same responses are supplied they carry different forces. Thus the response 'Max Smith' conveys the following different assertions respectively:

(22) a. Max Smith will be the leader of the New Zealand mutton lobby if Muldoon resigns.

b. Max Smith will be the leader of the New Zealand mutton lobby.

In fact, the need for disjuncts to be construable as specifying responses whose contents are mutually exclusive, applies here *mutatis mutandis*: the antecedent must be 'relevant' to the content of potential responses to the consequent interrogative in the usual sense of antecedent/consequent relevance in conditionals. When this condition does not apply the interrogative conditional is infelicitous:

(23) a. Can Huebner withstand the strains of the tournament, if he is required to play many adjournments?

b. Can Huebner withstand the strains of the tournament, if $2 + 2 = 4$?

(24) a. Who will be hardest hit if a nuclear winter were to hit Nebraska?

b. Who will be hardest hit if Nixon ran 4 times for president?

This suggests a more general point: interrogative sentences must be of an appropriate type to form compounds with declarative sentences. Other connectives also allow for such compounds:

(25) a. The question is this: Bill left yesterday evening, but when is Mary going to leave?

b. Huebner is a great player, but can he withstand the strains of the tournament? (Hoepelman 1983)

c. No matter who does what, Jill is going to be unhappy.

d. Even if it is not possible to be sure of the actual outcome, who appears to have been the loudest whiner of the '92 campaign?

And yet compounding is not without its restrictions. It appears that a requirement for successful mixed coordination is that it be asymmetric. Mixed 'or compounds' are extremely poor, a not particularly surprising fact, given the exclusive nature of 'or'. Mixed 'and compounds' are better, though not perfect:

(26) a. The question is this: Bill left yesterday evening, ?and / #or when is Mary going to leave?

b. Huebner is a great player ?and / #or can he withstand the strains of the tournament?

It is clear, then, that mixed cases do not always form successful compounds. There are some restrictions whose source seems plausibly syntactic, for instance the infelicity of interrogatives in various subordinate clauses. Processing is an additional source of difficulty: both syntactic and semantic differences exist between, respectively, interrogative and declarative sentences and questions and propositions. These two put together cause some difficulties in processing mixed cases as constituting

one compound unit, as well as leading to a preference for asymmetrical coordination structures/contents.

The conclusion that at least some of the successful compounds are syntactic compounds rather than a coordination across discourse will be finally established when we consider data from embedded interrogatives.

1.2.5 Assertoric uses

The assertoric use of interrogative sentences occur only in a restricted set of circumstances. In those contexts where the assertoric use can arise, it receives a content that is, roughly, a proposition that resolves the issue raised by an interrogatory use of the interrogative, which we have dubbed a 'resolving answer'. Most plausibly, this is because that answer is salient (or raised to salience) in such cases.

Uninterrogable contexts

If a context resolves a given question, that is, it contains a proposition that can serve as a maximal answer to the question, the context is not appropriate for an interrogatory use of interrogative sentences whose content in that context is that question. This follows from a basic preparatory condition on queries we shall discuss in section (1.4):

(27) a. (John and Bill came to the party,) # but who came to the party?

b. (Everyone came to the party,) # but who came to the party?

c. (No one came to the party,) # but who came to the party?

(28) a. (Bill came to the party,) # but did Bill come to the party?

b. (Bill did not come to the party,) # but did Bill come to the party?

(27c) is the source for the fallacious assumption that wh-questions 'presuppose' the existence of an instantiator.[1] As we see *any* potentially exhaustive answer to the

[1]See e.g. Comorowski 1989 p.152. and linguistic folklore.

question, not simply a negative one, vitiates the possibility of a successful interrogatory use.

Assertoric uses

The assertoric use of interrogative sentences occur only in a restricted set of circumstances. (29) is infelicitous:

(29) # I assert/claim the following: who left yesterday.

This illocutionary fact has a correlate in the domain of content in that directly predicating truth or falsity of an interrogative is problematic: [2]

(31) a. # It is false/true who committed the crime.

b. # It is false/true whether Zhang attacked Xie.

In those contexts where the assertoric use can arise, it receives a content that is, roughly, a proposition that resolves the issue raised by an interrogatory use of the interrogative, the 'resolving answer'. We suggest that assertoric uses of questions can be explained directly by assuming them to be exploitations of contexts in which the descriptive content of the query is already resolved. There appears to exist both a

[2]One response to this, due to Lewis 1972, has been to deny that interrogative sentences lack truth values, but rather that pragmatic facts lead to this impression. Lewis' basic intent, to show that the enterprise of characterising truth conditions can be generalised to define success conditions for any act, assertive, interrogatory or car-cleansing-ish, is reasonable. However, Lewis' claim concerning the truth values of interrogative sentences is not convincing and seems to involve lack of attention to descriptive/illocutionary content distinctions. One might wish to say that the content of the query is 'true' in some sense if it is successfully completed and that the reason we feel disobliged to intuit that is, as Lewis says, that it is self verifying. Even if this argument is convincing, it does not mean that the *descriptive* content of the query, the denotation of (any use of) an interrogative sentence is an object to which truth is applicable. In fact, Lewis's argument is applicable to assertions, as opposed to the propositions they express:

(30) a. I claim the following: Bill made a big mess of things.

b. That's true/false.

Here *that* does not apply to the fact that a claim has been made. No one would deny that. Rather, the possible source of disagreement is about the content of the claim. Hausser 1983, from a Montogovian perspective, notes that no reasons militate against assuming that sentences denote objects of a type other than *t*.

'generalised' mechanism for this use, as well as a more context sensitive one. Consider first wh-questions. A context c_0 resolves a unary wh-question $q(x)$ iff the context entails either that $q(x)$ is instantiated, or that there do not exist instantiators for $q(x)$. That is, $c_0 \models \exists x q(x)$ or $c_0 \models \forall x \neg q(x)$.

Now a maximal answer in the first case involves some individual (or set of individuals) c such that $q(c)$ holds. Unless q is in some sense self-answering, there will be nothing about an utterance whose content is q in and of itself to suggest that c is *the answer*. So, if the context does contain this information, it must have arisen through some previous utterance, or be a fact well known or easily inferrable enough to be assumed to be in that context. Cases such as these are typified in exchanges such as the following:

(32) a. A: Well let's put Max next to Cinderella.

B: Oh, but who did I say Max likes to sit next to.

A: You're quite right. Then we should change the sitting arrangements.

b. A: I can't see the boss here tonight.

B: Where do you think he is.

A: Are you serious? Geeze, that's incredible.

In neither case does a response (providing an answer to the question) get uttered. In both cases, the utterance by B gets affirmed by A, indicating that an assertion has indirectly been made by B. In order for these discourses to work, however, both participants must assume they have common knowledge of the answer. Otherwise, obvious breakdowns will ensue. Respectively:

(33) a. (Furling of eyebrows). No, I don't remember you mentioning Max's neighbourly preferences. OK, remind me...

b. Sorry pal, what the devil are you insinuating about our beloved boss?

So, this type of use depends on highly particularized information. Now consider the second type of resolving context, one where $c_0 \models \forall x \neg q(x)$. Since it does not

involve acquaintance with particulars, this option is one that is quite simple to *accommodate* to, in the sense of Lewis 1979: if the speaker utters a wh-interrogative sentence which the addressee sees no reason she should know a supporting instantiation for, and furthermore for which it is obvious to the addressee that the speaker is aware of this fact, what she can assume is that the speaker is exploiting the utterance of the interrogative to point out that, in fact, there *are* no grounds to assume that any such instantiation exists. Of course, it is even simpler for such a case to work if it is widely known that nothing instantiates the question:

(34) a. A: What papers has he published recently, anyway.

B: (Scratches head) Hmm, that's true I suppose.

b. A: Well, like, who believes what Billy Graham says anyway.

B: Yeah, I guess you got a point there.

(34a) provides an example of the accommodation kind, whereas (34b) is an instance of the 'obvious lack of instantiators' cases. As with the other type of use, this can also misfire if the addressee does not recognize the speaker's exploitation:

(35) a. Well, I think he has published some. Let me see...

b. Like, I think he's a fine and profound preacher.

Presumably this latter effect can also arise if some semantic reason constrains the question to be uninstantiable. For instance, one might speculate that this is the source for the impossibility of using certain questions containing negative polarity items interrogatively:

(36) a. Who liked any of his books, I ask you?! (# Good question, let's see...)

b. When has Mike ever been abusive?! (Mike has never been abusive.)

Moving on to yes/no questions, a context is resolving if it supports one of either extremal modalities, *true* or *false*, with regard to the queried proposition. For these

questions, considerations of calculability would suggest that the positive option provides the somewhat more generalised option. This appears to be supported by the variety of stock phrases invoking yes/no exploitations to assert the positive option:

(37) a. Does a bear shit in the woods!

b. Is the Pope Catholic!

c. Are you kidding me!

Some generalised cases with negative options asserted do exist nonetheless:

(38) a. Do I ever lie! Well then, don't worry.

b. Do bagels wear bikinis! (Jerry Morgan.)

As usual, these cases can misfire, if the addressee lacks the relevant knowledge concerning the obviousness of the proposition or its negation. Someone not aware of the facts of NBA Basketball would not be able to understand how the following assertion is supposed to work:

(39) Yeah, well, would Mugsy Bogues beat Manute Bol in a jump off!

1.3 Talking about questions

1.3.1 Introduction

In this section we consider the defining characteristics of uses of interrogative sentences embedded as complements of predicates. There are two main points we try to establish:

1. Interrogative sentences manifest a systematic ambiguity conditioned by the nature of the embedding predicate between a use that provides a question-like object,'question interrogatives' (QI), and a use that provides a resolving answer-like object, 'resolving answer interrogatives' (RI). QI complements can be used to report queries.

2. RI complements can be used to report only a strictly partial subset of felicitous responses to queries, namely those that convey resolving answers. Hence, the denotation of an RI does *not* provide for felicitous response conditions. Moreover, the class of propositional complement predicates that can embed RI complements is strictly delimited. Roughly, a necessary condition on a predicate to embed an RI is that the predicate is applicable to *facts* in the sense of Vendler 1972. The precise characterisation of the RI meaning and the class of RI embedding predicates is one of the central topics of chapter 7. The central conclusion this suggests is that the veridicality exhibited by the RI denotation cannot be captured simply by specifying the denoted object to be a true proposition (or construct thereof), since this property alone cannot separate predicates that are applicable to the denotation from ones that are not.

1.3.2 Reporting queries, responses and resolving answers

Interrogative sentences can occur embedded as sentential complements used to paraphrase queries, responses and more generally various illocutionary acts and mental states:

(40) a. Bill wondered who came to the party, so he asked me.

b. Since I knew who came to the party, I told him.

c. Even though he managed to find out who came to the party, he soon forgot.

The transition between direct paraphrase and indirect reporting as far as queries go is apparently no more or less problematic than reports of saying using embedded declaratives:

(41) a. Bill: Who is Mary going to invite to the party?

Bill asked who Mary was going to invite to the party.

b. Jill: Is Bill angry?

Jill asked whether Bill was angry.

Reporting assertions, specifically those made as responses to queries, raises much subtler issues. Certain felicitous responses, even indirect or extra-linguistic, can be reported using embedded interrogative complements:

(42) a. Q: Who committed the crime?

Jill: Bill did.

b. Jill told me who (she believed) committed the crime.

(43) a. (It is known that only George Bush and Dan Quayle could possibly have committed the crime.) Q: Who committed the crime?

Jill: Put it this way, Dan Quayle was out of town.

b. Jill indicated, albeit somewhat indirectly, who (she thought) committed the crime.

(44) a. Q: Who is your best friend?

Jill: (points at Mike)

b. (With that gesture) Jill indicated unequivocally who her best friend was.

Matters are more complex, however. In fact, the acceptability of the reportings above is dependent on the veridicality and exhaustiveness of the answers conveyed.[3] We would not assent to (44b) as a report of the dialogue if we were aware that Mike were *not* Jill's best friend. Rather, we would be forced to a report such as

(45) Jill provided an indication, albeit a false one, of who her best friend was.

The conclusion this suggests is not that responses that convey false answers are infelicitous from a semantic point of view, though of course they violate basic principles of cooperative conversation. Rather it suggests that interrogatives embedded by *tell* cannot be used to paraphrase just any felicitous response. Similar remarks *mutatis mutandis* apply to reports of responses that do not convey exhaustive answers:

[3]The issue of 'exhaustiveness' is an intricate one. As we shall suggest in chapter 7, it is an intricate notion not reducible to 'maximal in the lattice of answers', as often assumed. For the moment, though, we stick with this characterisation.

(46) a. Q: Say, who arrived from Europe yesterday?

Jill: I know Bill and John did.

b. In fact Bill and John were not the only people to arrive from Europe yesterday. Melissa did too.

c. Hence, *it is not the case that* Jill told me who arrived from Europe yesterday.

This does not mean that Jill's response is in any way *marked* from a semantic point of view in terms of its felicity as a response. A central assumption in past work (see e.g. Karttunen 1977, Groenendijk and Stokhof 1984, Engdahl 1986) has been that true and exhaustive answers are specified as part of the semantic content of the query. The evidence for this has been precisely the veridicality and exhaustiveness manifested by interrogatives embedded by such predicates as *tell* and *know*. This same meaning was assumed to be embedded by a query reportive predicate such as *ask* or by the corresponding mental puzzlement predicate *wonder* or the verb *investigate*, or the illocutionary query operator, which we shall discuss in the upcoming section.

As we shall see in the next subsection, there is strong evidence *against* identifying the denotations embedded by the two classes of predicates, and hence against thinking that veridicality and exhaustiveness are conveyed as part of the *semantic* force of the query. Moreover, it is not the case that false or inexhaustive responses cannot be reported as concerning the query they are directed at:

(47) a. Q: Who could I ask for an opinion about this issue?

Jill: I don't have a very good idea of that. Maybe Tony or Mellisa?

b. Jill provided a rough indication of who I could ask for an opinion about that issue.

c. Jill told me who I could ask for an opinion about that issue.

Regardless of the exhaustiveness and, to some lesser extent, the veridicality of the answer conveyed by the response, one would feel less hesitant to use (47b) as a report of the response provided in (47a) than, say, (47c).

Similarly remarks apply to (48b): it can be used to report the response provided to the query regardless of the veridicality or exhaustiveness of the answer conveyed. This is clearly not the case with (48c).

(48) a. Q: Who do you think offered me a job today?

Jill: Dunno, Dan Quayle perhaps.

b. Jill made a guess about who offered me a job.

c. Jill guessed who offered me a job.

The point such examples bring out is the need to distinguish *the resolving answer* from information that concerns or is pertinent to the query. The contents of all felicitous responses can be characterised in quite precise terms, as we shall see ultimately, by the latter description, whereas the former applies to the content of an extremely restricted set of felicitous responses.

We now move to consider evidence for an ambiguity in the interrogative denotation.

1.3.3 Interrogative sentences as questions and as resolving answers

Inference patterns

Picking up on the resolving answer Embedded in certain contexts, the interrogative sentence can be used to stand for the resolving answer to the question it describes. Embedded in other contexts, however, this substitution cannot go through.

(49) a. Jill told me whether Bill and John were the only people to arrive from Europe yesterday.

b. In fact Bill and John *were* the only people to arrive from Europe yesterday.

c. **It follows that:**

Jill told me who arrived from Europe yesterday.

(50) a. Jill asked me whether Bill and John were the only people to arrive from Europe yesterday.

b. In fact Bill and John *were* the only people to arrive from Europe yesterday.

c. **It does not follow that:**

Jill asked me who arrived from Europe yesterday.

It is important to note that it must be something about the content of resolving answer denotation of an interrogative that carries veridicality, since predicates that are not intrinsically factive such as *tell* and *guess* give rise to the above inference, which does not go through in case the complement is indicated to be false:

(51) a. Jill told me/guessed that Bill and John were the only people to arrive from Europe yesterday.

b. In fact, Bill and John were not the only people to arrive from Europe yesterday. Melissa did too.

c. Hence, *it is not the case that* Jill told me/(managed to) guess(ed) who arrived from Europe yesterday.

Picking up on the question Behaviour exactly converse to the previous inference pattern is exhibited when a question is identified. In the same contexts where it can stand for a question, the substitution is permitted. In the contexts where the interrogative sentence stands for the full answer to the question, the substitution cannot go through:

(52) a. An important question then was who should be elected president. Jill asked us/investigated (just) that last month.

b. Hence, Jill asked/investigated who should be elected president.

c. **Not:** Jill asked/investigated what the important question was.

(53) a. An important question then was who should be elected president. Jill told us/remembered that.

b. Hence, John told us/remembered what the important question at present was.

c. **Not:** John told us/remembered who should be elected president.

Interestingly, predicates embedding RI complements can pick up the denotation of an interrogative (in the sense that the anaphora is resolved to a denotation identical with that provided had an interrogative been syntactically present.) through 'ϕ' anaphora. The following sentence can have any of the following readings:

(54) a. The question is who to invite. Bill knows/told us ϕ.

b. Bill knows that the question is who to invite.

c. Bill knows/told us who to invite.

QI predicates, since they require a question, license only a reading similar to that in (54c):

(55) a. The question is who to invite. Bill asked us/inquired ϕ/that (yesterday).

b. Bill asked us/inquired who to invite.

ϕ anaphora are, nonetheless, 'deep' anaphors, in the sense that they can be resolved by non-linguistic inference:

(56) a. (Woman searching through Amtrak timetable for times of trains to Newark. Nagging father-in-law, pointing at conductor.) He'll know/tell you ϕ/that.

Hence, the readings in (54) need not be taken to conflict with the data in (53) which shows the interrogative in its RI denotation. The proposal we will ultimately offer for the QI/RI distinction will, nonetheless, provide an account for the possibility of anaphora as in (53).

That clause contrasts

RI predicates require propositional arguments. Hence, with one apparently principled exception, predicates of dependency such as 'depend on' and 'be influenced by',[4] they all (across a wide range of languages) subcategorise for 'that clauses'. QI predicates require interrogatory, non-propositional arguments. Hence, exceptionlessly and cross-linguistically, they *do not* subcategorise for 'that clauses'.[5]:

(59) Bill knows/told us/found out that Jill likes Bongo drumming.

(60) *Xiaokang asked/wondered/investigated/discussed that Jill likes Bongo drumming.

1.3.4 Permissible and impermissible ways of talking about resolving answers

A further indication that RI complements do not relate directly to the contents of responses to queries is provided by the restrictions they impose on predicates that embed them. Predicates that can embed propositions, in particular the contents of

[4]In terms of the basic paraphrase they support it is clear that such predicates are RI predicates:

(57) a. This issue depends on that issue.

b. This issue's being resolved to outcome A depends on that issue's being resolved to outcome B. (i.e. $A = F(B)$, for some function F.)

(57a) can be paraphrased, approximately as in (57b). In other words, 'depend' relates not issues, or questions, but the resolution of issues or questions. Notice that such predicates do license POSS-gerunds, a construction discussed briefly in chapter 7 and for which there are good grounds to assume a *fact-like* denotation:

(58) a. Jerry's arriving on time was caused by Tammy's reminding him to leave early.

b. Jill's finding the treasure intact depends on Mike's being absent from the dig.

The other criteria which we propose as characterising RI predicates such as anaphoric properties to salient issues and inferential properties apply equally to 'dependency predicates'. Why 'dependency predicates' do not license 'that clauses' is an interesting puzzle, but not one we shall attempt to solve here.

[5]This is not to say that such predicates might not have homonyms that do embed declaratives, but these have quite distinct, if not unrelated meanings. 'Ask', for instance, does have a declarative version which is synonymous with 'request'. Various other languages, e.g Hebrew, German or Arabic, apportion distinct verbs corresponding to 'ask' (a question) and 'ask' (as a request).

responses, cannot embed RI denotations. We provide here evidence that the restrictions on which propositional complement predicates can embed RI complements are highly systematic. In chapter 7, we will suggest, building on insights of Vendler 1972, that the predicates that can embed RI denotations are precisely those predicates that are applicable to *facts* in a sense we will make precise.

Two main classes of propositional complement predicates that cannot embed interrogatives emerge.

Non-veridical attitude predicates

(61) a. Q: Who came yesterday?

Bill: I believe/hope Mike did.

In fact, it was Mike who came yesterday.

b. # Bill believes/ hopes who came yesterday.

(62) a. Q: What do you think, will Max leave?

Bill: I believe/hope he will (not).

In fact, Max will leave.

b. # Bill believes/ hopes whether Max will leave.

(63) a. Q: Which pitcher will do what tomorrow?

Basil: I suppose/assume Gallego will pitch a no hitter, though Doc Gooden will be retired after 3 innings.

In fact, Gallego will pitch a no hitter, though Doc Gooden will be retired after 3 innings.

Basil supposes/ assumes which pitcher will do what tomorrow.

(64) a. Q: Tell me, did England beat Australia yesterday?

Basil: I assume they lost, actually.

In fact, England lost yesterday.

b. # Basil supposes/ assumes whether England beat the Wallabies yesterday.

Suitably veridicalised counterparts of these predicates do embed interrogatives

(65) a. Bill knows/has forgotten who came yesterday.

b. Bill knows/has forgotten whether Max will leave.

(66) a. Basil remembers/might forget which pitcher will do what tomorrow.

b. Basil remembers/might forget whether England beat the Wallabies yesterday.

Opinion-influencing illocutionary report predicates

'Opinion influencing' predicates (see chapter 7 for a rough characterisation.) such as 'argue', 'claim', 'assert', 'allege' and 'deny', do not embed RI complements:[6]

(68) a. Q: Who came yesterday?

Bill: I'd like to persuade you that Mike did.

In fact, it was Mike who came yesterday.

b. # Bill claimed/argued who came yesterday.

(69) a. Q: What do you think, will Max leave?

Bill: I'd like to try and convince you that he will (not.).

In fact, Max will leave.

[6]Dubitatives such as 'doubt', 'question' and 'deny' are Opinion Influencing predicates. Despite appearances, they do not embed interrogatives, even though syntactically their complement can be identical to a y/n question:

(67) a. # Bill doubts who came.

b. 'Bill doubts whether Millie will arrive.' = 'Bill doubts *that* Millie will arrive'. ($\neq$ 'Bill doubts that Millie will not come.' even if, in fact it is the case that 'Millie will not come.', as would be expected for an embedded y/n question.)

c. # Bill doubts whether Millie wants [tea or coffee] (as alternatives).

d. # Bill doubts whether or not Millie will arrive.

b. # Bill claimed/argued whether Max will leave.

(70) a. Q: Which pitcher will do what tomorrow?

Basil (a sleazy character): Look I've got good reasons to think that Gallego will pitch a no hitter, though Doc Gooden will be retired after 3 innings.

In fact, Gallego will pitch a no hitter, though Doc Gooden will be retired after 3 innings.

Basil alleged/asserted which pitcher will do what tomorrow.

(71) a. Q: Tell me, did England beat Australia yesterday?

Basil (a sleazy character): Look I've got good reasons to think that they lost actually.

In fact, England lost yesterday.

b. # Basil alleged/asserted whether England beat the Wallabies yesterday.

Non-OI predicates, including non-veridical reportive predicates do embed interrogatives:

(72) a. Jing told us/indicated to us who came yesterday.

b. Jing guessed/predicted whether Max will leave.

(73) a. Jing calculated/informed us which pitcher will do what tomorrow.

b. Jing concluded/explained to me, on the basis of some calculations, whether England would beat the Wallabies.

Conclusion: the RI denotation, factivity and true propositions

We defer provision of an account for the facts concerning applicability of predicates to the RI denotation to chapter 7, where we argue that neither a syntactic nor a pragmatic account can be adequate.

Let us note for the moment that if a semantic account of this phenomenon is to be found, it cannot lie in postulating that the RI denotation is applicable solely to factive predicates (as in Berman 1990) or conversely that the RI denotation is restricted to be a true proposition or a property of true propositions (see e.g. Karttunen 1977, or Groenendijk and Stokhof 1984.)

Thus, we have seen that various non-factive predicates are perfectly applicable to the RI denotation, they give rise to veridicality and exhaustiveness effects just like factive predicates embedding interrogatives. Moreover assuming that such predicates as *tell*, *predict*, *guess* etc are ambiguous between a factive denotation embedding interrogative denotations and a non-factive denotation embedding declaratives introduces various problems, not least in explaining the various inference patterns linking the two denotations:

(74) a. Jill told me/guessed that Bill and John were the only people to arrive from Europe yesterday.

Entails

b. Jill told me/(managed to) guess(ed) who arrived from Europe yesterday.

If and only if

c. In fact, Bill and John were the only people to arrive from Europe yesterday.

Conversely, assuming that the RI denotation is a true proposition (or a property of true propositions) cannot account for the contrasts in applicability to RI denotations among propositional complement predicates.

For one thing, the following is felicitous:

(75) a. Bill alleged something that turned out to be true.

b. Jill made a claim, a true claim, in fact.

Furthermore, even if one could justify some sort of appropriateness restriction against true (or presupposed to be true) propositions as arguments of OI predicates,

this would lead to serious problems with non-veridical propositional attitude predicates. Once again cancellation data of the following kind appear to indicate that there is no *conventional* implicature that bounds 'believe' by 'not knowing':

(76) a. Bill believes that John was on MDA last night, in fact he knows it.

More crucially, even if one does not desire to *reduce* knowledge to strengthened belief, it seems plausible that 'know' is bounded below by 'believe':

(77) # Bill knows that, but he doesn't believe it. ('Believe' can only be understood here in the sense 'accept' or 'be reconciled with'.)

Thus, building into 'believe' some appropriateness condition that its complement is *presupposed not to be known* will result in contradiction.

1.3.5 'About' QI

Further indication of the distinction between information *about the question*, which is provided in responses to queries using a given question and the resolving answer to a question is provided by interrogative embedding mediated by prepositions such as 'about'. Any information that concerns a question can be paraphrased by a report using an interrogative embedding by such a prepositions. The relations denoted by these prepositions can take a wide range of semantic arguments—individuals, propositions, questions etc:

(78) a. John knows/told me/thought a lot about Mary.

b. John knows/told me/thought a lot about Bill's attacking Mike in the town square.

c. John knows/told me/ asked/wondered a lot about/as to why Millie was angry that day.

There are indications that in this case, the QI denotation is being picked up on. For one, anaphora to a salient question gets resolved as in section (1.3.3): the reading (79a) gets is in (79b), not the one in (79c):

(79) a. The question is who was at the party last night.
Jill told us/remembered about that.

b. Jill knows/found out/told me about who was at the party last night.

c. Jill knows/found out/told me about the question being who was at the party last night.

Contrast this with:

(80) a. An important question then was who should be elected president.
Jill told us/remembered that.

b. **Hence,** John told us/remembered what the important question at present was.

c. **Not:** John told us/remembered who should be elected president.

In addition, the veridicality and exhaustiveness restrictions do not exist:

(81) a. Q: Who came yesterday?

Bill: I believe/hope Mike did.

b. Bill has a belief about who came yesterday.

(82) a. Q: Will Max leave tomorrow?

Basil: Let me try and persuade you that he will.

b. Basil made an assertion about whether Max will leave tomorrow.

(83) a. Q: What do you think—is Bill guilty?

Jill: I've thought long and hard about that issue.

b. Jill has thought extensively about whether Bill is guilty. (# Jill thought whether Bill is guilty.)

1.3.6 Embedding and compound interrogatives

We have already seen that binary connectives such as 'and', 'or', 'if/then' etc. provide means of constructing compound interrogative sentences. When such compound interrogatives are embedded, recursive structure is manifested, analogous to that of responses to compound interrogatives: the questions or resolving answers described by the complements are determined by the questions/resolving answers described by each of the constituents and by the meaning of the connective.

Question Interrogatives

(84) a. I've been wondering who you are and whether you understand any English.

b. Jill asked me who left last night and whether Bill is annoyed now.

c. Max asked me at that point who scored in the game last night and who was the best player on the field.

d. Jill wonders who Bill likes and when he is going to settle down.

Just as a query using a conjoined interrogative elicits a response directed at each conjunct, so embedding of interrogatives in their mode as questions describes a compound question: (84a) describes a desire for compound knowledge, knowledge that will resolve both the issue of the identity of the addressee and the issue of whether he understands English. Similarly, (84b) serves as a paraphrase of a compound query.

We noted before the existence of an exclusiveness condition determining whether an interrogative sentence could be construed as a compound. Similar considerations apply here. When the exclusiveness condition is met, the embedding can be interpreted as applying to a compound question:

(85) a. Jill wondered why Bill is annoyed or whether it is the case that he suffers from random facial seizures.

b. Jill asked why Jack was drinking so much or whether it was the case that he is an alcoholic.

c. I've been wondering who you are or whether you understand any English.

d. Jill asked me who left last night or whether Bill is annoyed for no reason.

Similarly, compound disjoined interrogatives that do not satisfy this criterion strongly favour a 'wide scope' reading for 'or':

(86) a. Jill wondered who Mary likes or when Bill is arriving.

b. Jill wondered why Bill is annoyed or if Jack is an alcoholic.

(86a) suggests, in the absence of contextual clues indicating that the disjuncts specify mutually exclusive information, that the reporter does not know exactly what Jill is wondering about, only what two alternatives might be.

Conditionalised interrogatives can be embedded by QI predicates: this is important evidence in establishing that the conditional interrogative is a syntactic unit, rather than coordination across discourse:

(87) a. Jill wondered who would be the leader of the New Zealand mutton lobby if Muldoon resigned.

b. Jill asked me whether Huebner can withstand the strains of the tournament, if he is required to play many adjournments.

c. Jill investigated who would be hardest hit if a nuclear winter were to hit Nebraska.

In (87a), Jill is described as wondering about the resolution of a hypothetical question that would arise. Similarly, (87b) serves as a paraphrase of a compound query, one that involves the querier assuming the truth of the antecedent as the background for the query paraphrased in the consequent. (87c) describes an investigation, one that proceeded from the hypothetical situation that a nuclear winter would hit Nebraska.

Embedded interrogative conditionals, then, provide examples of mixed declarative/interrogative compounds on a propositional (i.e. pre-illocutionary) level that cannot be explained away by using a 'distributive' or conjunction reduction interpretation. Further examples, once again of assymmetric compounds include:

(88) a. Jill asked me whether Huebner can withstand the strains of the tournament, even assuming he is a great player.

b. Jill asked me when Mary is leaving, even though/if Bill might decide not to leave.

c. # Jill asked me (that) Bill left and/or when Mary is leaving.

d. # Jill asked me when Mary is leaving and/or (that) Bill left.

Resolving answer interrogatives The data we saw above for question interrogatives transfers exceptionlessly to answer interrogatives, with one addition: 'and' and 'or' can also combine answer interrogatives with declarative sentences.

(89) a. Bill told me who you are and whether you understand any English.

b. Jill discovered who left last night and whether Bill is annoyed now.

c. Max told me at that point who scored in the game last night and that Strachan was the best player on the field.

d. Jill discovered who Bill likes and that he is going to settle down in Seattle.

(89a) describes an act of telling that provided the full answer concerning both the issue of the identity of the addressee and the issue of whether he understands English. Similarly, (89b) describes a discovery that resolved two issues, the issue of who left the previous night and the issue of whether Bill was annoyed. (89c) describes an act of telling that provided information that resolved who scored in the game and that indicated that Strachan was the best player. Similar remarks apply to (89d).

(90) a. Jill discovered why Bill is annoyed or whether it is the case that he suffers from random facial seizures. (But she doesn't yet know which is the case.)

b. Jill discovered why Bill is annoyed or that he suffers from random facial seizures. (But she doesn't yet know which is the case.)

c. Jill discovered why Jack is drinking so much or whether it is the case that he is an alcoholic. (But she doesn't yet know which is the case.)

d. Jill discovered why Jack is drinking so much or that he is an alcoholic. (But she doesn't yet know which is the case.)

Similarly, compound embedded 'or questions' that do not satisfy this criterion strongly favour a 'wide scope' reading for 'or':

(91) a. Jill discovered who Mary likes or when Bill is arriving.

b. Jill discovered why Bill is annoyed or if Jack is an alcoholic.

(91a) suggests, in the absence of contextual clues suggesting the disjuncts specify mutually exclusive information that one definite discovery was made, the exact nature of which is not known to the reporter, not that a discovery was made whose consequences are not fully determined as yet between two alternatives. Similarly for (91b).

In the case of conditionalised interrogatives, we noted a 'relevance condition' that needed to hold in order for the sentence to be interpreted as a conditionalised query. A similar consideration applies here:

(92) a. Jill told us who would be the leader of the New Zealand mutton lobby if Muldoon resigned.

b. Jill knows whether Huebner can withstand the strains of the tournament, if he is required to play many adjournments.

c. Jill discovered who would be hardest hit if a nuclear winter were to hit Nebraska.

In (92a), Jill is described as providing information about the resolution of a hypothetical issue that could arise. Similarly, (92b) serves to describe compound knowledge, one that involves assuming the truth of the antecedent as the background for resolution of an issue described by the consequent. (92c) describes a discovery of a potential outcome, proceeding from a hypothetical situation that a nuclear winter would hit Nebraska.

1.4 Interrogatory sentences, queries and answerhood

The data in the previous two sections points to a number of conclusions:

- Queries elicit responses the felicity of which is determined in a rule governed way which is recursively productive.
- A sufficient condition for a response to be felicitous is that it entail or implicate one of a class of propositions semantically determined by the content of the query ('answers').
- Interrogative sentences manifest a systematic ambiguity between a question-like denotation (QI) and a resolving answer-like denotation (RI).
- Queries can be reported by uses of (the QI denotation of) interrogative sentences embedded by the predicate *ask*.
- A strictly partial subset of felicitous responses to any given query can be reported by uses of (the RI denotation of) interrogative sentences embedded by the predicate *tell*. A necessary condition for this type of reporting to be available is that the answer conveyed by the response be true and exhaustive.
- It follows that the RI denotation cannot be used to provide *answerhood* conditions to a given query.
- Any felicitous response to a given query can be reported by uses of (the QI denotation of) interrogative sentences embedded by the noun *indication* mediated by prepositions such as 'about' and 'of': this brings out the difference between information concerning a question and information that *resolves* a question.
- The class of propositional complement predicates applicable to the RI denotation contains the class of factive predicates as a proper subset. Conversely, the class of predicates not applicable to the RI denotation cannot be characterised as a class of predicates inapplicable to true propositions.

We turn to sharpen and make definite two issues, the connection between queries and QI denotations, and the connection between response felicity and answerhood.

1.4.1 Queries, interrogative sentences and illocutionary force.

We have noted that queries can, on the whole, be reported by a use of an interrogative embedded by *ask*:

(93) a. Bill: Who is Mary going to invite to the party?

Bill asked who Mary was going to invite to the party.

b. Jill: Is Bill angry?

Jill asked whether Bill was angry.

In fact, performative phrases headed by 'ask', 'wonder' or 'tell' can serve as introducers of a query:[7]

(94) a. I'd like to ask you—Who is Mary going to invite to the party?

b. I wonder —Who is Mary going to invite to the party?

c. Tell me—Who is Mary going to invite to the party?

Why then do queries with and without an overt performative phrase get responded to? Why does a context appropriate for posing a given query require, roughly, that no answers be salient? Factors such as these do not need to be built into the meanings of individual interrogative sentences. In order to see why this should be so, we have to take into account the notion of the *illocutionary force* of a query.

[7]The fact that an imperative *tell* phrase can be used to introduce a query might suggest that the RI/QI ambiguity as resulting in a distinction in the semantic nature of the denotation is problematic. In fact, the only conclusions this should lead us to draw are these: on the one hand, embedding by *tell* must be individuated with as fine a grain as embedding with *ask*, a point we make in detail in section (2.2.2). On the other hand, the contents we provide for interrogatives in their RI denotation must be such as to enable them to serve as query introducers. Since the contents we will posit for the RI use will be *indefinite* descriptions for a resolving answer to the question, this means that the paraphrase 'Tell me Q' will receive on our account will be, roughly, 'Tell me an answer to the question denoted by Q'.

Illocutionary force v. Descriptive content

Language is action. The content behind this slogan, inspired by Austin, Grice, Searle, Vendler and others, is that utterances are a manifestation of human *action*, many of whose characteristics can be explained from the same basic principles that govern other, non-linguistic behaviour. In particular, this entails that any analysis of the content of a particular speech act needs to separate away constituents present as a consequence of the nature of the particular action α that is being performed ('illocutionary force': promising, asserting, querying, proclaiming etc), from constituents present in order to individuate that particular token of an α'ing from other possible tokens of α'ing ('descriptive [or propositional] content': promising *to do* x (as opposed) *to do* y, asserting *that* p (rather than) *that* r, querying *whether* q (rather than) *whether* s etc.). Naturally, the exercise of dividing up content between illocutionary and descriptive components will only be worthwhile insofar as there exist *principled* individuation schemes of actions *and* ways of describing them.

For a given utterance type, certain components of illocutionary force are associated by convention (by embedding under a performative phrase, intonation etc.), others are fixed only on a given occasion of utterance (utterance-types of declarative sentences without an explicit performative can be vague between uses as assertions, hypotheses, conversation fillers etc.) The same applies to descriptive content. Being associated by convention does not entail a *syntactic* association with the utterance type, that is, if c_0 is a constituent conventionally associated with the content of an utterance type u_0, it does not follow that there must exist a syntactic constituent of the syntactic structure of u_0, of which c_0 is the denotation, just as it does not entail the existence of a corresponding phonological constituent. This applies, once again, to both components, the illocutionary and the descriptive.

Specifically, for queries, we need not assume that there exists a null *performative* syntactic constituent for each utterance type that makes it usable as a query. On occasion such syntactic objects do surface, as we saw above, manifested by various phrases such as 'I wonder (slight pause)', 'I'd like to ask you', 'Could you please tell me' etc. Besides signalling the interrogatory nature of the speech act, each phrase can carry with it somewhat different implications, nonetheless a query can go through

without such a performative, and when such is not present, we need not assume that a null performative *phrase* is the source for the interrogatory force.

A particular constituent of the content of an utterance is intrinsically *illocutionary* if its presence is entailed from the nature of the act performed by the utterance. By analogy with implicature, we might call this 'calculability'. There is also an analogous notion of cancellability: if the same utterance type can be used in a different (syntactic/semantic) context and a particular constituent of content present in the one use disappears in the other context, then it must be part and parcel of the act that is being performed in the first context. A specific instance of this is given by embedding of interrogative sentences: in general, whatever aspects of content do not survive embedding should be seen as aspects that derive from the (illocutionary) nature of interrogatory uses (i.e. queries), not from their descriptive content.

Thus, a query's directive nature or the tendency that its answers are not known to the querier for instance, do not enter into the descriptive content:

(95) a. Bill told us who he liked, something we all knew in advance. (Neither teller, nor audience is entailed not to know the content of the complement.)

b. Bill forgot who Mary likes. (Bill need not be interested or want to find out who Mary likes.)

c. Who comes to the party depends on who is invited. (Cf. Karttunen 1977. Neither epistemic nor directive condition applies here.)

On the other hand, the fact that the content of elicited responses is conditioned by the descriptive content of the query is an aspect preserved under embedding, as illustrated by the following inference:

(96) a. Who does Jill adore? She adores Millie.

b. Bill knows who Jill adores./ Jill adores Millie./ Hence, Bill knows that Jill adores Millie.

Consequently, depicting the illocutionary force of a query with *QUE*, the full (illocutionary and descriptive) content of a query, with descriptive content q_0 (i.e. the content of a use of an interrogative sentence) can be symbolised as follows:

(97) QUE(q_0)

QUE is indexical in at least four dimensions: the speaker, the addressee and the utterance time and the domain at which the query is aimed that is supposed to be the arbiter of the answer, a *world* or some part of a *world*. We call it the *queried domain*. For the most part, we do not explicitly indicate this argument.

(97) is intended to be paraphrased as:

(98) 'Please provide if you can a response that concerns q_0, relative to the queried domain.'

This paraphrase will be of use once we make definite the relation 'response concerns' assumed to hold between a felicitous response and the descriptive content of a query. We turn to this matter presently. First, though, we need to justify the non-epistemic characterisation we have provided of the illocutionary force of a query. We have not built in anything that relates to speaker ignorance of the possible answers to the query. We will suggest that the appropriate notion is, roughly, non-salience of such answers in the context. In chapter 4, it will turn out that the characteristics of a context appropriate for querying are of considerable importance in assigning meanings to interrogative sentences. In order to derive this basic condition we need to provide a basic characterisation of 'querying'.

A characterisation of the speech act type 'query'

The act we will be engaged in characterising is the act of *questioning*, or, since we want to reserve the term *question* for the descriptive content, *querying*. This is the act the performance of which competent speakers would describe as having involved 'asking a question' or 'posing a query': such and such person uttered a sentence of a certain structure and content, and using a certain intonational pattern, and given that his intentions were thus and such and that certain appropriate conditions obtained, he could be said to have *posed a query* or *asked a question*. Since it is reasonably principled and familiar, we will utilise a Searle–style framework (see Searle 1969, Searle and Vanderveken 1985) for describing illocutionary forces.

The basic *illocutionary point* underlying a query is directive: the speaker requests the addressee to provide her with (potential) information of a type specified by the descriptive content. As Searle points out, this means that conditions that apply generally to requests, hold as special cases for questions: thus, since one of the basic sincerity conditions on requests is that the speaker wants the addressee to carry out the requested action, it follows that for questions, the speaker wants the addressee to provide him with the information of the specified type. Similarly, it should not be the case that the addressee can obviously not accede to the request.

In saying this, however, we do not want to commit ourselves to the assumption that the speaker does not *possess* the requisite information: we shall soon see cases in which this condition does not apply. A similar point could be made with respect to various other requests: a guard can request proof of identification from a person entering a building, even if he knows who the person is; a researcher can request to be provided with a copy of a book he already possesses and so forth.

What is the basic preparatory condition that must hold in order for a query to be felicitous? In attempting to gain insights into this question, we will be moved to refine somewhat our initial characterisation of the illocutionary point. Various researchers, starting with Aqvist, followed by Hintikka and Searle, have assumed that a query must, in broad terms, be made against a background of querier *ignorance*: the querier does not know the (true and complete) answer, and he asks his addressee to relieve him of his ignorance, to 'make it the case that he knows the answer.'

That this could not be quite right was realised fairly early on when the existence of exam or quiz questions was noted, where the querier is clearly not ignorant, and the addressee might or might not be. One simple, though not particularly revealing way out of this problem is suggested e.g. by Searle, who simply divides queries in two:

> (a) real questions, (b) exam questions. In real questions S wants to know (find out) the answer; in exam questions, S wants to know if H knows. (Searle 1969 p. 66.)

That this does not solve the problem soon becomes clear, since we can generate

a systematic pattern of successful query contexts, with the base case consisting of speaker ignorance, but with an infinity of counterexamples, based on the breakdown of common knowledge between the participants concerning the answer:[8]

1. The speaker does not know the answer to the question. (Basic speaker ignorance condition.)

2. The speaker knows the answer to the question, but does not know if the addressee knows the answer to the question. (Exam/Quiz-Master case)

3. The speaker knows the answer to the question, he knows the addressee knows the answer to the question, but knows that the addressee does not know that he, the speaker, knows the answer to the question.

4. The speaker knows the answer to the question, he knows the addressee knows the answer to the question, but does not know whether the addressee knows that he, the speaker, knows the answer to the question.

5. The speaker knows the answer to the question, he knows the addressee knows the answer to the question, he knows that the addressee knows that he, the speaker, knows the answer to the question, but knows that the addressee does not know that he, the speaker, knows this last fact.

6. etc.

Consider, the following example intended to illustrate option 3 above:

(99) A: When I think of women politicians, I don't think I can name a single compassionate one: Indira Gandhi, Golda Meir,...

B: Well, but who's your role model?

A: Petra Kelly.

B: That proves my point, doesn't it?

[8]Carlson 1983 makes similar points in his highly insightful and extensive discussion of uses of interrogative sentences in dialogue.

(99) appears to be a perfectly normal discourse. However, a plausible scenario underlying it is one in which B knows who A's role model is, knows that she knows who her own role model is, and assumes that she is not aware that he knows who her role model is. This, then, constitutes a natural counterexample to the preparatory conditions underlying both 'real questions' and 'exam questions'. More crucially, it suggests that, with suitable ingenuity,[9] such examples can be multiplied, and made to work against any formulation which attempts to reduce the preparatory condition of a query to the individual epistemic states of the discourse participants.

What this suggests is that looking towards *common knowledge*, or rather the lack thereof, is a promising direction for the basic preparatory condition. Thus, a natural substitute to the speaker ignorance condition would be in terms of lack of common knowledge between speaker and addressee with respect to the answer to the question.

There are, however, indications that even stated in terms of (actual) common knowledge this condition is still potentially too strong. Consider the following example, pointed out to me by Stanley Peters:

(100) (Scenario: outside Governor's office in Boise, Idaho. Speaker addressing a rally.)

Speaker: What do we want?

Crowd: Choice!

Speaker: Who do we want it from?

Crowd: The Governor!

There is quite plausibly in such a scene common knowledge between speaker and crowd. Admittedly, it is stretching things somewhat to call the exchange above as being one of query/response: one might hesitate somewhat before reporting the first exchange by saying 'A *asked* the crowd what they wanted, and they responded with one word 'Choice!'. Nonetheless, we would probably be less hesitant with a case where common knowledge existed, but where, for instance, either participant had forgotten

[9]Following the 'method' of Clark and Marshall 1981 who demonstrate how reference to an object requires, or at the very least is highly dependent on, the attainment of common knowledge between referrer and his addressee concerning the object of reference.

or was not sure, or even pretended that it obtained. Which, if applied to the case above, would probably make us hesitate less about the exchange being contrived in some way.

This suggests that we shift our attention not only from the participants' epistemic states to a more public domain, but even to a 'temporary' such repository. One suggestive possibility is to make use of a notion like 'common ground' (Stalnaker 1978) or '(linguistic) scoreboard' (Lewis 1979), built up incrementally as any discourse unfolds by the participants, as the domain which must be 'ignorant' with respect to the answers to the question. Thus, we have reached almost half circle from an epistemic to one close to an 'assertoric' ('Tell me truly') view of queries, suggested by Lewis and Lewis 1975. Note though that since responses do not, in general, carry veridicality or exhaustiveness, this suggests that 'tell me (truly)...' cannot serve as a general paraphrase of the query illocutionary operator. We will see in the upcoming section that building in some form of 'ignorance' or more aptly 'lack of salience' into queries permits a principled account of the different types of interrogatory and non-interrogatory uses that questions can have.

Following this line, then, the basic point underlying a query rather than being a request to relieve the speaker of his ignorance, is a request to increment the common ground with (potential) information of a type specified by the descriptive content. The preparatory condition for queries mandates that the common ground not contain the answer, more precisely that it not contain any proposition that can serve as a resolving answer to the question. That is, all queries must start from a context that permits a strengthening of the commonly believed answers to the question. Unless this condition is met, there will be no rationale for the query. In other words, if the point of a query is incrementation of the common ground with information of a certain, prespecified kind, the preparatory condition follows as a condition against *vacuous* incrementation. We have seen in section (1.2.5) data suggesting that a speaker who knows the condition to be *violated* can use the interrogative sentence assertorically.

The preparatory condition imposes, as a corollary, a condition on the content of questions: the content of a question must not in and of itself make any answers salient. So, in particular the content q_0 is not something that can be grasped in a

way that will provide access to any of the answers to q_0, *by conventional means.* It is, of course, always possible to concoct stories in which the utterance of a query makes one of its answers apparent, based on some prior knowledge: given that solely two suspects exist for a certain bank-robbery, overhearing one of the suspects whispering to her fiance 'Who committed the robbery?' licenses the inference that that particular suspect did not commit it.

These conditions provide us with a general, schematic characterization of a query: it is a request carried out by a speaker of an addressee to provide information of a type specified in the content of question, given that the (requested for) information is not salient in the context, both prior to and as a result of uttering the question. In order for it to constitute a sincere query, the speaker must be interested in the information whose provision she requests becoming part of the common ground. In addition, asking the question constitutes an attempt to elicit a (sufficiently strong) answer from the addressee.

Summarising:

1. QP: Speaker issues a request to Addressee to change common ground (of accepted assertions) according to descriptive content.

2. CPC: Common belief pool must be potentially changeable by answers. (Follows from QP, and condition on vacuous requests.)

2.1 PC: Content of question must be weaker than potential answers. (Follows from CPC.)

3. SC: Interest in content of request, i.e. in the appropriate information being added to the common ground. (Follows from QP, since a query is a request.)

4. EC: Counts as attempt to elicit an answer. (Follows from QP, since a query is a request.)

5. AC: Addressee should not be known to be unable to provide an answer. (Follows from QP, since a query is a request.)

It is only conditions 1 and 2 that need concern us in the sequel, since conditions 3-5 are consequences of the fact that a query has directive/requestive force. The latter conditions would apply with minor revision to acts such as asking someone to recite a poem.

1.4.2 Context types for querying

With the schematic characterisation of queries just made, we now move to discuss possible sources of variation among particular instances of queries. The suggestion we make is that a natural way of partitioning the space of queries is relative to how resolved the issue described by the question prior to its asking is: a common ground (henceforth 'context', for the current section) can be *neutral*, *biassed* or *resolved* with respect to a given issue, in a sense to be made precise presently. We have already shown in section (1.2.5) that contexts in which the issue is resolved cannot be used for interrogation. In section (3.5), we will see that the notions provided here interact very naturally with the definition we will propose for the relation of answerhood.

Thus, there are two classes of contexts in which queries can be posed: *neutral* and *biassed*. For a unary wh-question $q(x)$, a context c_0 is *neutral* iff the context entails neither that $q(x)$ is instantiated, nor that there do not exist instantiators for $q(x)$. That is, $c_0 \not\models \exists x q(x)$ and also $c_0 \not\models \forall x \neg q(x)$.

A context is *biassed* iff it is neither neutral, nor resolved. That is, it contains a partial answer to the question. The CPC places an upper bound on what a positive context can contain, roughly, a context for a question q cannot contain an answer to q that is potentially maximal. For wh-questions, this means that positive contexts can contain quantificational answers, typically existential answers, that is ones that indicate that the question has positive instantiations, whereas for yes/no questions, a positive context can contain information that indicates that p is more probable than its *a priori* probability.

We will demonstrate in section (114) that typical wh-interrogative-sentences although they often conversationally implicate the existence of an instantiator are compatible with the lack thereof. In other words, they are felicitous in neutral contexts. A further ramification of these notions is discussed in section (3.5) with respect to the *answerhood* relation we define, and in chapter 4, with reference to the link between the state of the context and the felicity of unmoved wh-phrases.

1.4.3 Felicitous responses

We now return to deal with the characterisation of the notion of response felicity. In section (1.2) we saw that intuitions on the coherence of a response with a query are, relative to a given context, crisp. It is important to emphasise this relativisation to a context: simply on the basis of the interrogative *sentence* it is not possible to predict what responses count as felicitous or not. And yet, given that speakers possess solid intuitions on response felicity, it is not plausible that this ability is pragmatically indeterminate. For a start there exist various responses that can be adjudged felicitous just on the basis of their literal content:

(101) a. Who committed the crime?

b. Bill did.

c. A friend of mine committed the crime.

Any speaker of English knows that by responding as in (101b,c), the following assertions are intended:[10]

(102) a. Bill committed the crime.

b. A friend of mine committed the crime.

She can figure out that these assertions are intended as responses to the query just *on the basis of their literal content.*

What the is different about the following exchange?

(103) a. Who committed the crime?

b. Well, put it this way, Dan Quayle was out of town.

[10]In fact, in chapter 4 we shall see grounds to suggest that the intended assertions are focussed variants of the sentences in (102): BILL committed the crime. This is immaterial to the issue at hand.

(103b) is a response that would not be adjudged felicitous on a context independent basis. A reasonable reaction to (103b) might be 'You must have misheard me: I didn't ask *who was out of town*, I asked *who committed the crime.*' However, if it is known that only George Bush and Dan Quayle could possibly have committed the crime, (103b) might very well be felicitous: it could be taken to *implicate* that Dan Quayle did not commit the crime, or perhaps even that George Bush was the culprit. In the latter case, the proposition 'George Bush committed the crime' has been *indicated*, though using means we would certainly not consider to be conventional.

What makes the responses in (101) and (in an appropriate context) (103b) *felicitous* is that directly or via implicature they convey propositions that stand in a context independent relation to the question which we shall call *answerhood.* Propositions that bear this relation to a question q, we shall call *answers* of q.

Note, then, that if a response is felicitous, be it direct or indirect, linguistic or extra-linguistic it can then, assuming veridicality and exhaustiveness conditions are met, be paraphrased using an interrogative embedded by such verbs as 'tell', 'suggest' or 'indicate', as in the examples (42, 43, 44) repeated here as (104, 105, 106)

(104) a. Q: Who committed the crime?

Jill: Bill did.

b. Jill told me who (she believed) committed the crime.

(105) a. (It is known that only George Bush and Dan Quayle could possibly have committed the crime.) Q: Who committed the crime?

Jill: Put it this way, Dan Quayle was out of town.

b. Jill indicated, albeit somewhat indirectly, who (she thought) committed the crime.

(106) a. Q: Who is your best friend?

Jill: (points at Mike)

b. (With that gesture) Jill indicated unequivocally who her best friend was.

The important point, then, is that in understanding why certain utterances are felicitous as responses to queries and can be reported using interrogative sentences embedded by illocutionary reportive predicates, we need to project away from the *way* an answer gets conveyed. That is, whether an answer is conveyed directly as a consequence of the literal content of a response or indirectly via implicature is tangential to understanding what it is about questions that makes for a rule governed system underlying the notion of response felicity. What is crucial is working out the general rule linking a question to the propositions that constitute its answers, a task that we undertake, descriptively, in the following section.

A question is, whichever way we choose to represent it, ultimately concerned with *an informational void.* In a wh-question such as 'Who does Bill like', the role of the 'likee' is not associated with any particular entity. In a question like 'Why did Bill leave', the motive adjunct is not associated with any specific proposition and so forth. Thus, an answer to a question provides a way of filling the informational void represented in the question. The answer carries a value for this void. A (possible) filler of a void represented by a question will be called a 'subsequent' (by antonymy with the notion of 'antecedent' utilised in discussions of anaphora.).

The reason we need to appeal to a notion like 'subsequent' is the existence of responsive acts, typically though perhaps not exclusively of a non-linguistic nature, whose *literal* content consists solely in providing the subsequent. It is only the intention underlying the act that makes the provision of the subsequent convey an answer.

(107) a. Who does Bill like?

b. (Response:) Bill likes Mary. (Subsequent:) 'Mary'. Hence: (Conveys:) 'Bill likes Mary'.

c. (Response:) points to Mary. (Subsequent:) 'Mary'. Hence: (Conveys:) 'Bill likes Mary'.

d. (Response:) I haven't got a clue. (No subsequent supplied, hence no answer conveyed.)

Accordingly, we can characterise the relation 'Response-concerning' that holds between a question q_0 and an information providing act r that counts as a felicitous response to a query whose content is q_0 as follows: Response-concerning(r, q_0) holds if and only if either

- r provides a subsequent s_1, intending this to convey a proposition p s.t. $Answer(p, q_0)$.
- r explicitly opts out of providing a subsequent.

The second category of responses, those that 'opt out' of conveying an answer are not, in general, influenced by the particular content of the query. That is, in broad outline, they are applicable as responses to any query.[11] We will not pay any particular attention to this class of responses in the sequel.

Given the discussion above, we will also ignore responses that do not directly convey answers when utilising response patterns as a probe to characterize answerhood. This places on us an obligation to filter away pragmatic considerations in adjudging the felicity of a response, since there can be cases of responses that are relatively infelicitous from a pragmatic point of view, but are still semantically felicitous. For instance:

(108) a. Q: What is Bill doing now?

Ming: Some boring thing no doubt.

b. Ming provided a partial indication of what he thought Bill was doing at that time.

This response is not helpful, relative to many plausible goals that might have motivated the querier to pose her query. Nonetheless, no one would question the cohesiveness of the query/response pair as a discourse, the responder could not be challenged about his linguistic competence etc.

[11]This statement is only approximately true: certain query types such as 'standard information queries' can be naturally opted out of, whereas 'echo queries cannot. This follows from the different functions and preparatory conditions that characterise them.

1.5 Characterising the Answer space of questions

1.5.1 Introduction

What we aim to do in this section is to offer a characterisation of the relation $Answer(p, q)$, that holds between a question q and a proposition p from the class of propositions that can be conveyed by felicitous responses to interrogatory uses of q. We will ultimately show that this relation can be obtained from a more general relation that is defined on propositions, of which questions are a subclass, we shall argue.

We have two main intents here. The first is to make a descriptive point concerning the range of possible answers. We claim that the class of answers. contents that can be conveyed by acceptable responses, has been quite considerably *under*-recognized in past work. The main reason for this has been the failure to recognize that the differential felicity of responses that convey resolving answers is a defeasible pragmatic tendency. Although queries are frequently made with the intent of eliciting the resolving answer, we will provide evidence that this is defeasible. Moreover, even when this intent is manifest, responses that do not provide resolving answers. either in terms of factuality or exhaustiveness, are not viewed as *incorrect* linguistic behaviour, rather they are viewed as uncooperative.

Thus, we emphasise the possibility and felicity of responses to wh-questions that convey quantified answers. Similarly, we point out an oft neglected fact about y/n questions, namely that the answers conveyed by 'yes' and 'no' are only a subclass of the possible answers. Similar remarks *mutatis mutandis* apply to alternative questions.

The general conclusion these data will point to is that conceptions in which questions are viewed as specifying either *choices*: a yes/no question between the two polar options, an alternative question between the specified alternatives, a wh-question between all possible instantiators (Hintikka, Hamblin on one construal of his semantics. Higginbotham and May) or resolving answers (Karttunen, Groenendijk and Stokhof)

intrinsically underdetermine the notion of answerhood.

This leads to the second and general point we want to make here: a question can be used to specify lower order information (properties of and relations between entities), and higher order information (properties of and relations between relations/properties.). The conclusion this would suggest is that the semantic nature of a question should be able to reflect this by being fairly symmetrical between these two options.

1.5.2 Wh-questions

Non-exhaustive answers

In this subsection, the status of non-exhaustive instantiated and quantified answers will be discussed, and claimed to be on a par, semantically, with instantiated answers. In other words, responses which convey answers that are quantified are as acceptable a manifestation of linguistic behaviour as corresponding responses that indicate answers that are referential. Making this point requires a little care: we do not wish to imply that in certain contexts the *desires* of the querier would be equally met by the provision of a quantified response as a referential answer. It is easy to refute this claim.

Frequently, it is indeed the case that a wh-query is posed because of a desire to find out the precise identity of the set of instantiators of the void described by its content. Responders identify this desire, and adhere to the norms of maintaining communicative cooperativeness. Hence, answers are implicated, perhaps even as generalized or default implicatures, to be true and exhaustive. This means that (cooperative) speakers will need to provide implicit or explicit indications when they are not being exhaustive:

(109) a. Who has worked in the past on this problem?

b. I know Hughes and McClair have.

In this example, the responder cancels any pretense of providing an exhaustive answer by relativising the force of the assertion to his own knowledge.

Our claim is, therefore, that the considerations that often bias a question to prefer exhaustively referential answers can and *should* be entirely explained on (*not* relegated to) a pragmatic level, by reference to basic principles of communication. For one, false and inexhaustive answers are *semantically* acceptable, even when the latter are unuseful: someone violating these requirements will usually be thought of as a jerk, rather than an incompetent speaker. But more crucially, there are many contexts where inexhaustive, in particular intrinsically quantified answers *are* felicitous, as we shall see.

The claim made here is not only that answers that are quantified *are* answers, but moreover that this is so even if it is the case that they are necessarily quantified. In other words, a response conveying a quantified answer can be felicitous, *even* if it cannot be construed as indirectly conveying a referential answer. One might, for instance, claim that when one responds to the question 'Who came' with 'Every syntactician.', this is construed to be indirectly conveying the answer 'The group consisting of all syntacticians came.'. The claim here, then, is that even when such an analysis is impossible, as is typically the case with monotone-decreasing quantificational forces, the response is felicitous, semantically.

In order to be convincing, we need to provide contexts for queries, where both quantified and referential answers are equally and simultaneously acceptable, since we want to ward off any suggestion that an ambiguity might be responsible.

Consider the question in (110) uttered during an election night special:

(110) Who supported the candidate?

It is clear that the interviewer is not interested in a full and explicit characterisation of the set of supporters of the candidate. What he is interested in are general trends, describing both the make up of the set of supporters and of its complement, and references to select members of either of these sets. Responses such as the following, the first of which is non-exhaustive instantiated, the other two of which are quantified, would be typical:

(111) a. Senator Johnson and Representative Smith definitely did.

b. Surprisingly enough most naturalised Javanese did.

c. Well, few people from the West did.

Consider now the question in (112) made as a request for a plan of action for two people standing at a crossroads, waiting for a traffic light to change:

(112) Which way shall we go now?

The addressee can pick one specific way, and point at it, as in (113a), or she can choose a no less optimal strategy, implicit in the quantificational answer indicated in (113b). Both responses are equally felicitous, it seems:

(113) a. *That* way.

b. Any way that's not blocked at present.

A similar example is the following:

(114) a. What church do you want to see now?

b. The one in Magdalene College.

c. Doesn't matter which as long as it's one that's open.

Negative answers

A special case of a non-instantiated answer is provided by negative quantification. We show here that responses conveying a negatively quantified answer are felicitous. This is interesting in its own right, given a common misconception that wh-queries presuppose the existence of an instantiator. The reason for considering this issue here is that it provides another instance of a commonly occuring answer that is not instantiated.

Here, as ever, we have to broach the subject with some care, in order not to confuse *semantic* with *pragmatic* commitments. Drawing this line in the domain of 'presuppositions' can be tricky. This applies especially to questions, since, on an

intuitive level, it is quite tricky to separate one's *grounds for posing a query using a specific form/content*, which typically involve a suspicion that a certain state of affairs obtains, from *the conventional felicity commitment associated with that form/content.* Thus, under normal conditions, when I ask my apartment-mate

(115) What should I buy at the store?

it is quite clear that I am moved to pose this query by a belief that

(116) There exists something that I should buy at the store.

This, however, is not enough to clinch the issue: what we want to know, in a sense, is the degree of spoilage that the discourse undergoes if I am to ask this question while not holding the belief in (116). Am I going to be considered simply incautious or actually misusing the language? Bare intuitions about this can be somewhat shaky. Nonetheless, there do exist further means with which one can attempt to decide the issue: one such concerns *cancellability.* If we can explicitly cancel the suspected presupposition without resulting infelicity, this provides initial grounds for suspecting that it is a *conversational* implicature, rather than a (semantically associated) presupposition. This is, in fact, possible:

(117) What, if anything, should I buy at the store?

(117) can be uttered felicitously. In contrast to (115), uttering (117) does not obviously suggest that the querier believes (116). In fact, once we reflect somewhat we discover sentences the utterance of which under natural circumstances, even without explicit cancellation, does not seem to involve a belief of the type exemplified by (116):

(118) Who is in favour of amending the Bill of Rights?

The speaker of the House can felicitously utter the sentence in (118) before a vote without a necessity that he *believe* anyone supports amending the Bill.

Contrast this last sentence with a sentence like

(119) Where is your car parked?

It is quite hard to think of a context where (119) would be uttered without the existential implication arising. A case somewhere in between would be

(120) What did you have for dinner last night?

This tends to suggest the existential assumption, though is clearly usable by a worried parent addressing an overworked son or daughter.

The fact that the subject matter of the question seems to influence the strength of the association of the implication is suggestive of its status as a conversational implicature. Further evidence for this comes from its calculability: however one is going to represent the interrogated role, there is clearly something special about it. Thus, a hearer can reason: 'Why use (118a) when the neutral 'Is anyone in favour of amending the Bill of Rights.?' could have been used? The speaker must have had grounds for using a form in which the role of 'supporter of the amendment' is highlighted, whose potential instantiators are sought. Hence, he must believe that, indeed, there must exist instantiators, etc.'

Thus, the possibility of explicit and implicit cancellation of the implication, as well as its calculability, should be taken as strong evidence for the position that the implication is not a semantically associated condition on felicity, but rather a pragmatically conditioned inference.

That is, whatever akwardness some might feel about query/response sequences such as:

(121) Who left last night? No one.

(122) Why did you leave the apartment? For no reason.

this is due not to the violation of a presupposition, but to an incompatability with a commonly generated conversational implicature. Negative answers should also be naturally accommodated by the semantics.

Conclusions about answers to wh-questions

It has been argued in this section, that there are no convincing grounds, methodologically or empirically, for thinking that instantiated or referential answers have any particular priority as answers *concerning* the question. There are no especial grounds for constituting the denotation of a question solely from instantiations, if it is to serve as the source of the possible answers. If we follow that strategy, then the denotation has to be expanded to include all quantifications as well, with a resulting unwieldy semantic object. Similarly, we have argued that the preference for *exhaustive* answers is a defeasible, pragmatic effect, which does not persist in all contexts.

Schematically, the answer space to wh-questions can be characterised as follows:[12]

(123) a. Instantiated answer: $q(x)(x \rightarrow referent)$. (Referent supplied by referential act using a referential NP, deixis etc)

Quantificational answer: Quantificational-Force x(q(x))

1.5.3 Answers to yes/no questions

The name 'yes/no question' is, of course, just that, a name. It does, nonetheless, carry with it a highly misleading implication: that is, that the answers conveyed by 'yes' and 'no' are in some way privileged.[13] The (modest) claim here is that there exists a range of other possible answers that can be conveyed by felicitous responses to queries using such questions. This should not be construed as claiming that 'yes' and 'no' (more precisely the propositions they indicate.) do not have an important status from a *pragmatic* point of view, namely in terms of the goal that leads to a query being posed, especially 'yes'. Moreover, since a resolving answer to a yes/no question is invariably one of the polar alternatives, the RI denotation of a yes/no

[12]In fact, in chapter 4, we will see motivation to expand this characterisation to include 'functional answers', propositions of the schematic description P(x,f(x)), where f is a function. What the source of such answers is will be an important topic of that chapter.

[13]But see Bauerle 1979 for discussion. I am also indebted, indirectly, to Bolinger, who in his 1978b argues at great length against 'deriving' yes/no sentences/questions from alternative sentences/questions.

interrogative will entail that one of those alternatives is enatiled to hold whenever an interrogative is embedded by an RI predicate:

(124) a. Bill knows whether Millie left town.

b. In fact, Millie left/did not leave town.

c. Hence, Bill knows that Millie left/did not leave town.

(125) a. Did Bill leave town yesterday?

b. Probably.

c. It's unlikely.

It seems quite incontrovertible that either of (125b,c) are felicitous as responses. They might not resolve conclusively the puzzlement that caused someone to ask the question in the first place, but so it goes. There is something additionally interesting about these responses. That is, that the answers they convey are quite clearly (126a) and (127a) respectively, rather than (126b) and (127b):

(126) a. Probably Bill left town yesterday.

b. Probably Bill did not leave town yesterday.

(127) a. It's unlikely that Bill left town yesterday.

b. It's unlikely that Bill did not leave town yesterday.

What is interesting about this is that it poses a problem for any semantic representation of the 'yes/no' question that is symmetric between the 'yes option' and the 'no option', the kind of object we would expect a choice strategy to produce for such questions. Since a symmetrical object should trigger either an ambiguity for such responses or some nonsensity: 'probably f(p,¬ p)'.

Further examination of the possible responses triggered by y/n sentences shows that essentially any modal denoting expression can be supplied as a response:

(128) a. Has Jill finished her cigar yet?

b. Possibly.

c. It's likely.

d. I doubt it.

e. Unlikely to an extreme.

In all cases, the interpretation that arises is:

(129) a. It's possible that Jill finished her cigar.

b. It's likely that Jill finished her cigar.

c. I doubt that Jill finished her cigar.

d. It's unlikely to an extreme extent that Jill finished her cigar.

The data we see here suggests the following: the content of a y/n interrogative concerns primarily the 'yes option', the proposition that gets queried. What the question triggers are indications of modalities that apply to that proposition.

Searle 1969, with Frege 1919, apparently assumes that the descriptive content of a yes/no question 'Is it the case that p?' is simply *p*. While in certain contexts declarative sentences can be used with a force somewhat weaker than assertoric, asking for the interlocuter's affirmation, this cannot provide the whole story. yes/no interrogatives can be embedded, and the resulting meaning is significantly *distinct* from declarative sentence embedding:

(130) a. Jill: Did Bill leave Mike's house early yesterday?

b. Jill asked me whether/# that Bill left Mike's house early the previous day.

In fact, as we have seen, there exists a uniform class of relations that is applicable to interrogatory denotations, but not to declarative ones and vice versa. The semantic basis for facts such as the following has been argued for in section (1.3):

(131) Jill wondered/asked/investigated whether/#that Bill left Mike's house early the previous day.

Even for those verbs that are applicable to interrogatory and declarative denotations the putative identity in descriptive content of a yes/no query 'Is it the case that p' and an assertion 'p' cannot be squared with the following inference:

(132) Bill told me whether he likes Jill.

Bill does not like Jill.

Hence, it is not the case that Bill told me that he likes Jill.

(In fact,) it is the case that Bill told me that he does not like Jill.

Thus, the answer space of a yes/no interrogative 'Is it the case that p' is:

(133) ($R(p)$, where R is a propositional modality.

Given the considerations we have raised previously about the possiblity of quantificational answers, one might wonder why the only answers that seem triggered by such questions are instantiated (i.e. instantiators of the 'modality' argument role.). We will suggest that on a natural way of defining the notion of quantificational answer, the notion of quantificational answer to a yes/no content is no different from a quantificational answer to a declarative content. Hence, on that score, from an informational point of view, the contents of yes/no sentences are no different from declarative contents. See section (3.5) for details.

1.5.4 Alternative questions

There are two types of alternative sentences, sentential and constituent illustrated respectively in the examples that follow:

(134) a. Is Bill arriving tomorrow or has he decided to postpone his visit by a couple of days?

b. Is Betty a machinist or is it just the case that she's played the piano for a long time?

(135) a. Do you want tea or coffee?

b. I like saw this movie recently, but I kinda forget what actually happened: Did Johnson or Oswald assassinate Kennedy?

We suggest the following analysis, drawing on the insight of Bauerle 1979, who points out that alternative questions seem to share properties with both yes/no questions and with wh-questions.[14]

Sentential alternative questions are none other than disjoined yes/no questions. Thus, a sentential alternative question contains an unspecified modality for each disjunct, with the usual exclusiveness implicature deriving from 'or' that we saw in section (1.2.2) applied to disjoined interrogative sentences as well. roughly that in order to resolve the issue raised by the compound question, it is sufficient to resolve one junct:

(136) a. Is Betty a machinist or is it just the case that she's played the piano for a long time?

b. You've got a good eye: Betty is a machinist. As it turns out she also plays the piano.

c. Yeah I've been wondering myself. I think it's more probable that she's a machinist, but I wouldn't rule out the possibility that she's diddled around a bit on a piano.

d. It's unlikely that she's a machinist. As for the other option, I couldn't tell you.

In (136) we provide various examples of felicitous responses to a sentential alternative question where the indicated answers are compound propositions composed of

[14]The proposal concerning alternative constituent questions was originally made to me by Mark Gawron in conversation.

the answers we have previously shown are associated with yes/no questions. Clearly, 'simplex' answers are also possible, and perhaps more frequent. But this follows from the properties of 'or' precisely in the same way as answers to questions like

(137) (Tell me,) what lectures are you going to or (at least) what else is there to do during the conference?

.

Constituent alternative questions can profitably be analysed as possesing contents similar to the corresponding wh-question whose role has been completely parametrised:

(138) a. Did Johnson or Kennedy escalate the Vietnam war?

b. Which person escalated the Vietnam war?

The difference resides in the fact that whereas in the wh-question the *escalator* role is restricted by the descriptive condition 'animate', in the case of the alternative question the restriction is provided by the property 'is identical to Johnson or Oswald':

(139) $Escalated(x_{johnson \vee kennedy}, Vietnam - War)$

This provides a ready account for the similarity in response, noted by Bauerle, between the following two queries:

(140) a. OK, so which person escalated the Vietnam war, Kennedy or Johnson?

b. Did Kennedy or Johnson escalate the Vietnam war?

Further implications of this analysis, in particular to issues of the relationship between semantic and syntactic scope will be discussed in Chapter 4 and 5.

1.5.5 The Answerhood relation

We have investigated the answerhood relation holding between two types of semantic entities, questions and propositions. The main source of data in understanding the nature of this relation comes from propositions conveyed directly or via implicature by felicitous responses to queries whose descriptive contents are questions.

We have suggested the following schematic characterisations:

(141) a. Wh-interrogative sentence $q(x)$: answers are either instantiated or quantified:

Instantiated answer: $q(x)(x \rightarrow referent)$. (Referent supplied by referential act using a referential NP, deixis etc)

Quantificational answer: Quantificational-Force x(q(x))

b. Yes/no-interrogative sentence 'Is it the case that p'

R(p), where R is a propositional modality.

c. Sentential alternative question: 'Is p or q the case':

Answer space of a disjoined yes/no sentence 'Is p the case or is q the case'.

d. Constituent alternative question: 'q([x or y])'.

Answer space of wh-interrogative-sentence content q(z, where z is restricted by descriptive property 'z is x or y').

Chapter 2

Past work on questions

2.1 An N-ary relational analysis

The data on answerability encountered above is suggestive of the following account: an N-ary wh-interrogative-sentence denotes an N-ary relation obtained from the open proposition underlying the question by abstracting over all variables free in that propositiond, whereas a yes/no sentence denotes the property of being a modality that applies to the queried proposition:

(142) a. 'Who likes Bill' denotes λ x LIKES(x,bill)

b. 'Who likes whom' denotes λ x,y LIKES(x,y)

c. 'Why does Bill like Mary' denotes λ p BECAUSE(p, LIKES(bill,mary))

d. 'Does Bill like Mary' denotes λ R R(LIKES(bill,mary))

An approach such as this has been proposed by Hull and Keenan (e.g. Keenan and Hull 1973, and Hull 1975.), and, somewhat differently, by Hausser and Zaefferer (e.g. Hausser 1976, 1983, Hausser and Zaefferer 1979, Zaefferer 1979). The intuition driving these proposals is that interrogatives are unsaturated categories that get saturated by their responses:

(143) a. Who likes Mary? John.

b. Where did Bill go? To France.

c. Are you happy? Yes.

Hull and Keenan implement this idea through a definition of truth conditions directly on 'question/answer' pairs (in our terms: interrogative sentence/response pairs.) The Hausser/Zaefferer approach, more transparently and plausibly, makes interrogatives directly denote relations.

Answerhood is captured directly in this type of approach:

(144) a. Instantiated answers: Question(subsequent).

b. INST-ANS('Who likes Bill') = $\{p|\exists$ y (p = λ x LIKES(x,bill)(y)) $\}$

c. For instance: 'John likes Bill' (= λ x LIKES(x,bill)(john))

(145) a. Quantified answers: Quantifier(Question)

b. QUANT-ANS('Who likes Bill') = $\{p|\exists$ Q (p = Q(λ x LIKES(x,bill))) $\}$

c. For instance: 'Every woman likes Bill' (= λ P[$\forall x(woman(x) - P(x))$] ($\lambda$ x LIKES(x,bill)))

There are a number of significant problems, however. The approach involves positing extremely fine grained distinctions among the semantic types of interrogative sentences: any two interrogatives differing in r-ity (e.g. unary/binary/ternary wh-interrogative-sentences) or in the type of argument (e.g. where constituent interrogative is adverbial v. where constituent interrogative is an argument of a verb.) are distinguished. This has no independent motivation, as we shall now see: it is directly falsified on the one hand by what is in effect identical distribution and coordinatability among all interrogative sentences. On the other hand a complete mismatch in distribution and uncoordinatability with equivalent non-interrogative expressions (e.g. transitive or intransitive verbs with binary and unary wh-questions.) This latter problem can be remedied by assuming the existence of a special, extremely fine type structure for interrogatives: One can account for this by making the type

structure sufficiently complex: distinguishing the type of a unary wh-question from that of an intransitive verb etc. But in so doing, any hope of capturing interesting generalisations in the type theory is severely undermined.

2.1.1 The semantic uniformity of interrogative sentencs

Distribution

As far as use goes, we have argued above that interrogatives have only a restricted, indirect assertoric use, whereas, for reasons that have been outlined above and will be made precise in chapter 3, a central use in queries. These remarks apply with equal force to all types of interrogatives: all interrogatives can be used to query, though certain pragmatic factors bias against assertoric uses of certain types of questions (most particularly alternative questions).

As far as their occurrence in embedded contexts, yes/no and wh interrogatives (of all r-ities and argument types) have an almost identical distribution, as noted in Karttunen 1977:

(146) a. Bill asked/wondered/told me/discovered who came to the party.

b. Bill asked/wondered/told me/discovered who likes whom.

c. Bill asked/wondered/told me/discovered why Mary had left the CPUSA.

d. Bill asked/wondered/told me/discovered when Mary had left the CPUSA.

e. Bill asked/wondered/told me/discovered how Mary had left the CPUSA.

f. Bill asked/wondered/told me/discovered whether [John or Mary] had gobbled up the remains of the birthday cake.

g. Bill asked/wondered/told me/discovered whether Mary had left the CPUSA.

The two exceptions noted by Karttunen for wh/yes-no distributional distinctions would appear to have principled explanations: dubitatives ('doubt', 'question', 'be suspicious' etc.) appear to license yes/no interrogatives, but not wh-questions. We

have already suggested in section (1.3.4) that this is an exceptional use of 'whether' as a declarative complementiser, rather than reflecting any semantic difference between yes/no questions and wh-questions. The other problem class, emotives ('regret', 'resent', 'appreciate' etc), do not appear to license yes/no interrogatives. They do license wh-interrogatives, but not entirely happily, suggesting a general problem of embedding interrogatory denotations, potentially explicable on pragmatic grounds, as hinted in chapter 7.

Note, then, that this evidence is extremely hard to square with an N-ary or property of proposition denotation for wh and yes/no interrogatives, respectively. Predicates seem to be extremely particular about the r-ity of the arguments they can take: thus, Control phenomena can be analysed, albeit controversially, as cases where predicates, oscillate between an argument that is saturated (0-ary) and one that is unary (a property). Apart from this and a number of closely analogous phenomenon (belief *de se*), whose analysis is also controversial, no other cases are known calling for rampant polyadicity.

In addition, property and relation denoting expressions such as verbs, verb phrases, adjectival phrases, prepositional phrases and so forth, manifest a distribution that is distinct, complementary, for the most part, to sentential interrogative phrases:

(147) a. Bill is /happy/at home/*which person does he like/*whether he likes Jill.

b. Bill /likes Mary/*which person does he like/*whether he likes Jill.

Interrogative phrases do have limited, shared distribution with nominal phrases, as objects of certain prepositions, though this aplies also to other proposition denoting phrases such as POSS gerunds:

(148) Bill knows about /the man/Mary/who does what here/whether Jill should arrive soon/Bill's assaulting Harry.

Coordination

Another fairly standard test for identity of semantic category is coordination. Once again the results here are quite robust. All interrogative sentence types can be coordinated with each other. Conversely, interrogative sentences do not coordinate with

other semantic categories, apart from (declarative) sentential types, with certain restrictions discussed above in sections 2 and 3.

(149) a. Who does Ming like and why is Millie troubled by this? (argument with adjunct question.)

b. Who does Ming like and does he tend to be socially active? (wh with yes/no question.)

c. Who does Ming like and which of Ming's friends got acquainted with which member of Ming's family recently? (unary with binary wh)

d. Which of Ming's friends got acquainted with which member of Ming's family recently and is Ming himself socially active? (multiple wh with yes/no.)

This can also survive embedding:

(150) a. Jill asked/discovered who Ming likes and why Millie is troubled by this. (argument with adjunct question.)

b. Jill asked/discovered who Ming likes and whether he tends to be socially active? (wh with yes/no question.)

c. Jill asked/discovered who Ming likes and which of Ming's friends got acquainted with which member of Ming's family recently? (unary with binary wh)

d. Jill asked/discovered which of Ming's friends got acquainted with which member of Ming's family recently and whether Ming is himself socially active? (multiple wh with yes/no.)

2.1.2 Interrogative sentences as unsaturated expressions

Finally, let us return to consider one of the major assumptions driving the relational approach, namely that interrogatives are unsaturated expressions that get saturated by their responses:

(151) a. Who likes Mary? John.

b. Where did Bill go? To France.

c. Are you happy? Yes.

This assumption is dubious. On the one hand, the property of eliciting elliptical follow ups does not characterize interrogative sentences:

(152) a. I really like someone on their team. (pause) Billie T. Beelzebub.

b. A: A really goofy guy walked into our office this morning.

B: Who?

c. I liked each and every one of them: Candi, Bubba, Xerxes, the whole bunch.

(152) illustrates the following: cohesive units of discourse allow for elliptical utterances. (152a,c) show that a statement can be followed by an utterance detailing a previously unspecified constituent. (152b) is an example of sluicing (see e.g. Ross 1969 and chapter 4.). Arguably, some, perhaps all of these constructions, as elliptical responses, are profitably analysed as containing null syntactic constituents. In order to account for the possibility of interpretation of ellipsis, we do not need to come up with a special denotation for the source of the ellipsis, all we need is the availability to reconstruct, in either a syntactic or a semantic sense, an appropriate antecedent.

In order for the elliptical response data to determine crucially the denotation of interrogatives, one would have to argue that such responses are in some way 'canonical', to a degree equalling the bond tying a verb to its arguments. The data does not support this, as indicated (implicitly) by Hausser himself:

(153) a. Who came?

b. John/ John did/ John came/ John came, because of Mary etc. (Hausser 1983, example 49, p.124)

2.2 Supra Propositional approaches

2.2.1 Basics

The dominant line of research into the meanings of interrogative sentences is one initiated by Hamblin and Stahl, and subsequently refined particularly by Karttunen and Groenendijk and Stokhof.[1] The basic intuition driving this approach is that interrogatives specify either *answerhood conditions* (apparently Hamblin's original intuition), or, *resolving answer* conditions (Karttunen, Groenendijk and Stokhof).

Hamblin proposed to model this idea as follows:

> Semantically, an answer to a question on a given reading is any statement whose denotation set is contained in that of the question. (Hamblin 1973 p. 52.)

In other words, a question would be defined in such a way that membership in the denotation of the question could be set up as a criterion for answerhood. In particular, on this line, a wh-interrogative-sentence denotes the set of instantiations of the underlying open sentence, a yes/no sentence denotes a set consisting of the queried proposition and its negation, an alternative sentence denotes a set consisting of the alternative propositions, etc.

(154) a. Any use of 'Who likes Bill' denotes λ p [$\exists$ y (p = LIKES(y,bill))]

b. 'Who likes whom' denotes λ p [$\exists$ y $\exists$ x (p = LIKES(x,y))]

c. 'Why does Bill like Mary' denotes λ p [$\exists$ q (p = BECAUSE(q, LIKES(bill,mary)))]

d. 'Does Bill like Mary' denotes λ p[(p = LIKES(bill,mary) $\vee$ p = $\neg$ LIKES(bill,mary))]

Thus, the important insight of Hamblin's was to provide for a denotation that was uniform across various kinds of interrogatives, regardless of their form. This immediately disposes with the problem faced by the relational approach.

[1]These are among the most prominent contributions to interrogative *sentence* meaning within this approach. In the next chapter, we will have reason to acknowledge contributions of various researchers to interrogative *phrase* meaning.

Before proceeding, it is useful to be explicit about how the Hamblin denotations, and more generally, the supra-propositional approaches are going to be construed here, similarly for meaning/denotation distinctions. The supra-propositional approach has, for the most part, been formulated within possible world semantics. However, in our appraisal of the approach, we try whereever possible to avoid making reference to issues that arise out of the choice of that conceptual framework, in order to make clear that our comments apply to the supra-propositional approach in general, and not simply to its possible worlds realisation. This is quite simple to maintain with respect to Hamblin and Karttunen's accounts. We will not maintain this with respect to Groenendijk and Stokhof's account into which a number of features of possible worlds semantics are intrinsically built (propositions as sets of worlds, intensional/extensional argument verbs etc.)

In chapter 6, we will provide arguments for adopting a particular conception of meaning. For the current chapter, however, unless it is of crucial importance, as in evaluating Groenendijk and Stokhof's account, we are going to be non-commital about what *meanings* consist in. Hence we concentrate on the contents produced by uses of expressions: when we say 'expression X denotes Y' we mean 'on any use of expression X, its content is semantic object Y'. Thus, our remarks can be construed relative to whichever theory of meaning one wishes to adopt, that provided by classical Montague Grammar, a functional theory like Kaplan's, situation semantics, etc.

Furthermore, we use λ-calculus to provide for property and relation denoting terms. These can be construed as denoting sets, but where possible we try to provide a discussion in terms of properties and relations, which leaves open the possibility of non-reductive modellings of properties and relations. Similarly, when we use the word 'proposition' in this section, this can be thought of as a set of possible worlds, but we leave open the possibility of construal in terms of singular propositions or states-of-affairs of some ilk.

Our basic claim will be that the supra-propositional approach, on whatever conception, faces a number of intrinsic problems: the notion of answerhood it provides is too restricted, it cannot make adequate QI/RI distinctions, it underindividuates the meanings of interrogative sentences, it runs into problems in defining compound

forming binary operations, and finally, it faces significant problems in construal of the denotations as objects of querying.

We start by considering embedded interrogatives, which domain Hamblin did not address. Data from this domain provided much of the motivation for amendments to Hamblin's conception proposed by Karttunen and Groenendijk and Stokhof.

2.2.2 Embedded interrogatives

Karttunen

Karttunen's idea is to make interrogative sentences denote the set of their *true* answers. More precisely, he proposes that a question is a *property of propositions*, the property of being a true instantiation of the open sentence underlying the question, in the case of wh-questions, the property of being the true option in the case of yes/no questions. Within the possible worlds framework his theory is couched, this boils down to the following revision of Hamblin: at any world, the Karttunen denotation is a subset of the Hamblin denotation, the former is obtained by eliminating the *false* answers from the latter.

(155) a. Any use of 'Who likes Bill' denotes λ p [TRUE(p) $\wedge$ $\exists$ y (p = LIKES(y,bill))]

b. 'Who likes whom' denotes λ p [TRUE(p) $\wedge$ $\exists$ y $\exists$ x (p = LIKES(x,y))]

c. 'Why does Bill like Mary' denotes λ p [TRUE(p) $\wedge$ $\exists$ q (p = BECAUSE(q, LIKES(bill,mary)))]

d. 'Does Bill like Mary' denotes λ p[TRUE(p) $\wedge$ (p = LIKES(bill,mary) $\vee$ p = $\neg$ LIKES(bill,mary))]

The motivation Karttunen adduces arises from considerations pertaining to embedded interrogatives, specifically the *veridicality* characteristic of the RI denotation discussed in section (1.3). Recall that veridicality for this use of interrogatives occurs even when embedded by verbs that are not intrinsically factive such as *tell* or *guess*

By restricting the defining criterion of answerhood to true instantiations Karttunen insightfully places the burden of veridicality on the complement rather than on the embedding predicate.

There are a number of problems, however, with this approach to complementation. The ones we dwell upon for the moment concern semantic type.

The problem of doublets One of Karttunen's important insights was that interrogative sentences could not be treated reductionistically, as, for instance, in accounts inspired by Hintikka. Hintikka's basic paraphrase is:

(156) a. John V's who came $\leftrightarrow$ Any person is such that if he came, then John V's that he came.

b. John V's whether it is raining $\leftrightarrow$ If it is raining, then John V's that it is raining, and if it is not raining, then John V's that it is not raining.

No meaning *per se* is assigned to the interrogative clause, rather it is reduced to the meaning of the corresponding declarative.

The basic defect diagnosed by Karttunen is that this method does not work for verbs that take interrogative complements, but do not take declarative complements. While this can, in some cases, be partially remedied by lexical decomposition of the problematic verb into components such that one component is declarative embedding ('wonder' = 'want-to-know'), there appear to be cases where no plausible decomposition is available such as (157):

(157) a. Who wins the race depends upon who enters it.

b. When Mary will arrive will be influenced by who drives the bus.

Karttunen solves the problem he points to with Hintikka-like proposals, since interrogative clauses are assigned an interpretation independently of whether they occur in a propositional-complement context. Insofar as the Karttunen semantics allows us to interpret interrogative complement VP's where the verb does not embed 'that-clauses', we have a net explanatory gain. The problem, however, is that in so

doing, we threw out a big chunk of baby, morbidity unintended, as well as dirty water from Hintikka's bathtub. On the Karttunen semantics, an interrogative sentence denotes a *property* of propositions. Hence a verb embedding an interrogative sentence denotes a relation one of whose arguments is a property of propositions. This means, however, that any verb that also embeds a declarative sentence, which in turns denotes a proposition, must be assumed to be ambiguous: denoting both a relation on properties of propositions and a relation on propositions.

It then becomes an arbitrary lexical matter to be captured by meaning postulate that an inference pattern relating the two complements such as the following arises:

(158) a. Jill told me/guessed who arrived from Europe yesterday.

b. In fact Bill and John *were* the only people to arrive from Europe yesterday.

c. Hence, Jill told me/guessed that Bill and John were the only people to arrive from Europe yesterday.

The problem is that this inference pattern holds exceptionlessly for verbs embedding both complements, a point we discussed in motivating the QI/RI denotation ambiguity in section (1.3). Moreover, the distinctness in semantic type of the two complements on the Karttunen semantics means that type-shifting will be required to interpret mixed compound complements:

(159) a. Max told me at that point who scored in the game last night and that Strachan was the best player on the field.

b. Jill discovered who Bill likes and that he is going to settle down in Seattle.

c. Jill discovered why Bill is annoyed or that he suffers from random facial seizures. (But she doesn't yet know which is the case.)

d. Jill discovered why Jack is drinking so much or that he is an alcoholic. (But she doesn't yet know which is the case.)

This problem, then, is the problem of propositional doublets.

Question Interrogatives v. Resolving Answer Interrogatives The flip side of Karttunen's severing of the link between propositional complements and RI complements is the inability to make distinctions between QI complements and RI complements: the fact that *wonder* or *ask* have no 'that-clause' counterpart, while *know* does, does not emerge from the account in any principled way. Similarly, for the other contrasts discussed in section (1.3), including the following contrast in inference patterns, one instance of which we repeat here:

(160) a. Jill told me/knew whether Bill and John were the only people to arrive from Europe yesterday.

b. In fact Bill and John *were* the only people to arrive from Europe yesterday.

c. Hence, Jill told me/knew who arrived from Europe yesterday.

(161) a. Jill asked me/wondered whether Bill and John were the only people to arrive from Europe yesterday.

b. In fact Bill and John *were* the only people to arrive from Europe yesterday.

c. **It does not follow that:**

Jill asked me/wondered who arrived from Europe yesterday.

Groenendijk and Stokhof

Groenendijk and Stokhof's proposal is designed both to remedy the doublets problem and to enable 'question/resolving answer' distinctions to be captured. They seek to 'propositionalise' the Embedded Interrogative complement whereever that needs to be done (*know*), blocking this possibility otherwise (*wonder*). Their important insight, then, is the recognition of the ambiguity of the interrogative denotation.

Groenendijk and Stokhof's account is strongly dependent on certain tools from Montague Grammar, most notably the distinction between the extension and the intension of an expression and the way it is cast using possible worlds. The intension of an interrogative sentence, on their view, is an equivalence relation, q_0, on possible worlds (for simplicity, I ignore issues of tense in the discussion). Two worlds

are equivalent according to q_0 if and only if they determine the same 'answers' to the underlying open sentence. That is, if the extension of the relation obtained by abstraction of the interrogated roles over the open sentence is identical in both worlds.

(162) a. Intension of 'Who likes Bill': λ w,v[w is equivalent to v if and only if Extension(λ x LIKES(x,bill), In: world w) = Extension(λ x LIKES(x,bill), In: world v)] (The equivalence relation on worlds such that w is equivalent to v if and only if the property 'being a liker of Bill' has the same extension in both worlds.)

b. Intension of 'Who likes whom': λ w,v[w is equivalent to v if and only if Extension(λ x,y LIKES(x,y) , In: world w) = Extension(λ x,y LIKES(x,y) In: world v)] (The equivalence relation on worlds such that w is equivalent to v if and only if the relation ' x likes y' has the same extension in both worlds.)

c. Intension of 'Why does Bill like Mary': λ w,v[w is equivalent to v if and only if Extension(λ p BECAUSE(p, LIKES(bill,mary)) , In: world w) = Extension(λ p BECAUSE(p, LIKES(bill,mary)) In: world v)] (The equivalence relation on worlds such that w is equivalent to v if and only if the property ' being a reason for Bill's liking Mary' has the same extension in both worlds.)

d. Intension of 'Does Bill like Mary': λ w,v[w is equivalent to v if and only if Extension(λ R R(LIKES(bill,mary) R=TRUE or R=FALSE) . In: world w) = Extension(λ R R(LIKES(bill,mary) R=TRUE or R=FALSE) In: world v)] (The equivalence relation on worlds such that w is equivalent to v if and only if the property ' being the truth value which holds of Bill's liking Mary' has the same extension in both worlds.)

What is the *extension* of an interrogative sentence at a given world? This is none other than the equivalence class to which that world belongs, namely a set of worlds. Notice, however, that, within a possible worlds semantics conception, a set of worlds is not just any semantic object, but no less than the *intension* of a *declarative* sentence

(163) a. Extension of 'Who likes Bill' at world w_0: λ v[Extension(λ x LIKES(x,bill), In: world v) = Extension(λ x LIKES(x,bill), In: world w_0)] (All worlds v in which the property 'being a liker of Bill' has the same extension as in w_0.)

b. Extension of 'Who likes whom' at world w_0: λ v[Extension(λ x,y LIKES(x,y) , In: world v) = Extension(λ x,y LIKES(x,y) In: world w_0)] (All worlds v in which the relation 'x likes y' has the same extension as in w_0.)

c. Extension of 'Why does Bill like Mary' at world w_0: λ v[Extension(λ p BECAUSE(p, LIKES(bill,mary)) , In: world v) = Extension(λ p BECAUSE(p, LIKES(bill,mary)) In: world w_0)] (All worlds v in which the property ' being a reason for Bill's liking Mary' has the same extension as in w_0.)

d. Extension of 'Does Bill like Mary' at world w_0: λ v[Extension(λ R R(LIKES(bill,mary) R=TRUE or R=FALSE) , In: world v) = Extension(λ R R(LIKES(bill,mary) R=TRUE or R=FALSE) In: world w_0)] (All worlds v in which the property 'being the truth value which holds of Bill's liking Mary' has the same extension as in w_0.)

This, then is the key to Groenendijk and Stokhof's solution to the doublets problem, and by extension to making question/resolving answer distinctions among embedded interrogatives: they assume that one class of predicates (e.g. *ask*, *wonder*) deals simply in intensions of interrogative sentences, the other class in extensions of interrogative sentences (e.g. *tell*, *know*).

Since intensions are individuated with finer grain than extensions, the prediction this approach makes is the following:

> Question interrogatives are individuated with finer grain than resolving answer interrogatives.

This prediction, however, is falsified by various data, as we shall now see.

A general argument against differential individuation of questions and answers The general point is that for any two interrogative sentences q_1 and q_2 whose

intensions are distinct, but that, in a given world, have identical extensions, Groenendijk and Stokhof's account predicts that the following discourse is contradictory:

(164) a. I asked you q_1, not q_2.

b. In that case, I'll tell you q_1, not q_2.

It is fairly easy to convince oneself that this need not, in fact, will not usually be the case. Thus consider the sentences:

(165) a. What does Bill like.

b. What does Jill like.

For simplicity, assume 'Bill' and 'Jill' are rigid designators denoting distinct objects b and j in all worlds. Assume moreover that in some subset of worlds, W_0, b and j like exactly the same objects, but that in some other subset of worlds, V_0, their likes diverge somewhat. Then, Groenendijk and Stokhof's prediction is that for any world in W_0, the second sentence in (166) is contradictory, whereas the first sentence is not:

(166) a. I asked you what Jill likes, not what Bill likes.

b. In that case, I'll tell you what Jill likes, not what Bill likes.

This seems like an utterly false prediction.

Disjunctive Ambiguities Groenendijk and Stokhof try to argue for the relative coarseness of resolving answer interrogatives compared to question interrogatives (their extensional/intensional) by claiming that the latter, but not the former manifest an ambiguity triggered by the conjunction 'or'. If this were the case, it would find an explanation on the Partee/Rooth account of wide scope readings for 'or' as correlating with disjunctions of intensions rather than extensions. Without entering into this issue of how to account for 'wide scope' or, we believe that Groenendijk and Stokhof's claim is not supported in any way by the data.

Groenendijk and Stokhof's claim, specifically, is that (167) carries two possible construals, whereas (168) is unambiguous, carrying only the construal in (168b):

(167) a. Jill wonders who walks or who talks.

b. Jill wonders about one of two questions (I'm not sure which.) Who walks or who talks.

c. Jill wonders about a certain question, representable by the following disjunction 'Who walks or who talks.'

(168) a. Jill knows who walks or who talks.

b. Jill knows the answer to one of two following questions (though, I'm not sure which.) Who walks and who talks.

c. Jill knows the answer to a certain question, representable by the following disjunction 'Who walks or who talks.'

For ease of reference let us call the reading in the (c) sentences the *unary* reading (since it concerns a single question represented as a disjunction.), and the reading in the (b) sentences the *distributed* reading.

We have already discussed disjunction among interrogatives in sections I.2.3 and I.3.5. We saw there that *unary* readings for interrogatives, just as with embedded declaratives, are dependent on the plausability of exclusion between the possible resolutions of each disjunct. With this fact in mind, we will see that whereever and if unary readings exist, question interrogatives (examples in (170)) do not make them more accessible than answer interrogatives (examples in (169). If anything, the contrary holds.

(169) a. I saw the name 'Jack Morris' flash on the screen. Since it was around the time of game 7, at that time I knew who had just won the world series or who had just lost it, though of course I didn't know which was the case (i.e. I didn't know who had just won the world series and I didn't know who had just lost it.)

b. (Same scenario) Jill realised which pitcher was about to be elected MVP or (alternatively) what team were going to become that year's goat.

c. Jill discovered why Bill is annoyed or whether it is the case that he suffers from random facial seizures. (But she doesn't yet know which is the case.)

d. Jill discovered why Jack is drinking so much or whether it is the case that he is an alcoholic. (But she doesn't yet know which is the case.)

(170) a. I saw the name 'Jack Morris' flash on the screen. Since it was around the time of game 7, I suddenly started wondering who had just won the world series or, perhaps, who had just lost it, though since I was mostly interested in my old pal Jack, I wasn't particularly bothered about finding out which outcome was the case.

b. (Same scenario) Jill wondered/asked me which pitcher was about to be elected MVP or (alternatively) what team were going to become that year's goat.

c. Jill wondered why Bill is annoyed or whether it is the case that he suffers from random facial seizures.

d. Jill asked why Jack was drinking so much or whether it was the case that he is an alcoholic.

Mixed coordination Groenendijk and Stokhof's proposal still requires several type shifting operations to deal with mixed cases of coordination involving declaratives and interrogatives. We shall see below that the supra-propositional approach in general requires special purpose type shifting simply to coordinate interrogative sentences successfully.

(171) a. Max told me at that point who scored in the game last night and that Strachan was the best player on the field.

b. Jill discovered who Bill likes and that he is going to settle down in Seattle.

c. Jill discovered why Bill is annoyed or that he suffers from random facial seizures. (But she doesn't yet know which is the case.)

d. Jill discovered why Jack is drinking so much or that he is an alcoholic. (But she doesn't yet know which is the case.)

A compound consisting of a declarative and an interrogative embedded by a proposition-complement verb cannot be directly interpreted, since it is the *extension* of an interrogative that is identical in type to the *intension* of a declarative. So this kind of coordination, just as in the coordination of interrogative sentences, also requires type shifting for Groenendijk and Stokhof: the type of the interrogative has to be shifted to its extensional level. Only then can it proceed.

Yet more problematic are conditionalised interrogatives:

(172) a. Jill wondered who would be the leader of the New Zealand mutton lobby if Muldoon resigned.

b. Jill discovered whether Huebner can withstand the strains of the tournament, if he is required to play many adjournments.

c. Who will be hardest hit if a nuclear winter were to hit Nebraska?

Since these sentences can be used to query and are embedded by QI predicates, extensive type shifting will be needed to provide such sentences with contents:

(173) If Declarative-sentence, then Interrogative-sentence

The interrogative sentence has to be shifted to its extensional level in order to be of the right type to conditionalise with a declarative. The compound then needs to be lifted back to the intensional level in order to be embedded by QI predicates or queried.

The supra-propositional approach and embedded interrogatives: appraisal

Let us summarise our observations concerning embedded interrogatives and their treatment within the supra-propositional approach, and add one more intrinsic problem.

The basic intuition both analyses try to capture is that interrogatives specify the resolving answer to a query. As we shall see this will prove problematic in the theory of answerhood that it provides. We have seen that the denotation type posited by Karttunen, requires positing problematic ambiguities among propositional complement predicates. Groenendijk and Stokhof's attempt to remedy this problem by positing a distinction between two types of interrogative denotation is an important insight, but their particular reductive proposal that casts RI complements as extensionalised QI complements makes predictions about the differential individuation of the two types of complement that are clearly false.

However, both accounts face additional problems centering on the issue of the veridicality of the RI complement: capturing the veridicality of the RI denotation by making it a true proposition (Groenendijk and Stokhof) or a property of true propositions (Karttunen) cannot account for the highly systematic contrasts in applicability to RI denotations among propositional complement predicates discussed in detail in section (1.3.4):

(174) a. Q: Who came yesterday?

Bill: I believe/hope Mike did.

In fact, it was Mike who came yesterday.

b. # Bill believes/ hopes who came yesterday.

(175) a. Bill knows/is aware of who came yesterday.

b. Bill knows/is aware of whether Max will leave.

(176) a. Basil remembers/might forget which pitcher will do what tomorrow.

b. Basil remembers/might forget whether England beat the Wallabies yesterday.

Furthermore, both accounts face a serious problem in meaning individuation: Consider the following two questions:[2]

[2]This problem was pointed out to me by Stanley Peters.

(177) a. Which bachelors (here) are bachelors?

b. Which males (here) are bachelors?

(177a) is a self-answering question. We would not expect many people, save perhaps philosophers or, at their worst moments, semanticists, to wonder about it or ask it, since they apparently know how to resolve it. (177b), on the other hand, is contentful: we would expect male-chasing persons, for instance, to wonder about it, though often not to know the answer to it. It, thus, seems to be the case that neither of the following pairs of sentences are synonymous:

(178) a. Jill told me/knew/discovered which bachelors (here) are bachelors. (Namely, all of them are.)

b. Jill told me/knew/discovered which males (here) are bachelors. (Namely, Mike, Bill and Ted.)

(179) a. Jill asked me/ wondered/ inquired which bachelors (here) are bachelors. (And I stared at her, wondering if perhaps she was taking a philosophy class.)

b. Jill asked me/ wondered/ inquired which males (here) are bachelors. (And I gladly supplied the answer.)

Note, however, that the Karttunen and the Groenendijk and Stokhof interrogative meanings predict synonymy. The two sets of propositions in (180) (or partition classes in 181)) are *necessarily* identical, since all bachelors are males. The problem for the Karttunen approach is quite independent of the grain of the underlying proposition space:

(180) a. λ p [TRUE(p) $\wedge$ $\exists$ y Bachelor(y) $\wedge$ (p = IS-A(bachelor,y))]

b. λ p [TRUE(p) $\wedge$ $\exists$ y Male(y) $\wedge$ (p = IS-A(bachelor,y))]

(181) a. Intension of 'Which bachelors are bachelors': λ w,v[w is equivalent to v if and only if Extension(λ x(bachelor(x) $\wedge$ IS-A(bachelor,x)), In: world w) = Extension(λ x(bachelor(x) $\wedge$ IS-A(bachelor,x)), In: world v)] (The equivalence class on worlds such that w is equivalent to v if and only if the property 'being a bachelor that is a bachelor' has the same extension in both worlds.)'p determines the same extension of $\lambda x(bachelors(x) \wedge bachelors(x))$ as q'.

b. Intension of 'Which bachelors are bachelors': λ w,v[w is equivalent to v if and only if Extension(λ x(male(x) $\wedge$ IS-A(bachelor,x)), In: world w) = Extension(λ x(male(x) $\wedge$ IS-A(bachelor,x)), In: world v)] (The equivalence class on worlds such that w is equivalent to v if and only if the property 'being a bachelor that is male' has the same extension in both worlds.)

2.2.3 Three supra propositional theories

Before proceeding to discuss the general merits of the supra-propositional account, let us summarise the basic proposals of each of the three versions.

Hamblin proposes that on any use of a unary wh-interrogative sentence, it denotes the set of its instantiations:

(182) Any use of 'Who likes Bill' denotes λ p [$\exists$ y (p = LIKES(y,bill))]

Karttunen motivated by concerns from embedded interrogatives proposed that on any use of a unary wh-interrogative sentence, it denotes the set of its true instantiations:

(183) Any use of 'Who likes Bill' denotes λ p [TRUE(p) $\wedge$ $\exists$ y (p = LIKES(y,bill))]

Groenendijk and Stokhof in attempting to solve problems for Karttunen's analysis propose that the intension of a unary wh-interrogative sentence is an equivalence relation on worlds identifying those worlds in which the propoerty obtained by abstracting over the open proposition associated with the interrogative sentence:

(184) a. Intension of 'Who likes Bill': λ w,v[w is equivalent to v if and only if Extension(λ x LIKES(x,bill), In: world w) = Extension(λ x LIKES(x,bill), In: world v)] (The equivalence class on worlds such that w is equivalent to v if and only if the property 'being a liker of Bill' has the same extension in both worlds.)

b.

c. Extension of 'Who likes Bill' at world w_0: λ v[Extension(λ x LIKES(x,bill), In: world v) = Extension(λ x LIKES(x,bill), In: world w_0)] (All worlds v in which the property 'being a liker of Bill' has the same extension as in w_0.)

2.2.4 Answerhood

There are essentially two answerhood notions that can be associated with the supra-propositional approach. The first, 'weak answerhood', is the one might associated with Hamblin if we take him at his word, as per the quote provided above:[3] In other words, membership in the denotation of the interrogative sentence is set up as a criterion for answerhood. The major problem faced by this criterion is the inability to accommodate responses that convey quantified answers such as those discussed in section (1.4.1):

(185) a. Who supported the candidate?

b. Surprisingly enough most naturalised Javanese did.

c. Well, few people from the West did.

(186) a. Which way shall we go now?

b. Any way that's not blocked at present.

[3]Groenendijk and Stokhof 1984 chapter 1, fn. 38 dispute this interpretation, arguing that whatever differences exist between Hamblin and Karttunen are attributable to differences between the EFL and PTQ frameworks used by the respective researchers. Be that as it may, and going beyond historical exegesis, the popular (mis?)conception of Hamblin provides for a somewhat different conception of questions, which serves as the distinguishing feature of Bennett and Belnap's supra-propositional approach.

In other words it forces us to reject the answerhood of a wide range of propositions that seem to provide for perfectly felicitous responses, whose sole defect is that, in certain contexts, they are not *pragmatically* optimal.

'Strong answerhood' is the notion of answerhood derivable from the Karttunen and Groenendijk and Stokhof approaches: on this criterion, a proposition is an answer to a given use of the interrogative if it satisfies the descriptive property provided by the interrogative. This means being the maximally true ('exhaustive') instantiation of the open proposition underlying the interrogative: thus an answer to a use of 'Who likes Bill' must satisfy the property λ p [TRUE(p) $\wedge$ $\exists$ y (p = LIKES(y,bill))].[4]

So, according to this approach, any felicitous, answer-conveying response carries with it as part of its *semantics* the information that it is true and exhaustive:

(187) a. Q: Who likes Bill.

A: Mary likes Bill.

b. λ p [TRUE(p) $\wedge$ $\exists$ y (p = LIKES(y,bill))](LIKES(mary,bill))

So, the responder is committed to the following: by uttering 'Mary likes Bill' as a response to 'Who likes Bill', 'Mary likes Bill' is asserted to be true and exhaustive.

This is highly questionable, as evinced by various examples of natural responses conveying non-exhaustive referential and quantified answers provided in section (1.4.1). It seems to get semantic and pragmatic roles exactly confused, since the requirement for a response to be true, and the requirement for it to be exhaustive are most profitably analysed as pragmatically derived, as are the implications that an answer indicated by a response has those properties.

Nonetheless, it is important to be aware that Karttunen's basic argument carries with it considerable force, so long as one assumes that all embedded interrogatives denote identical semantic objects. If we accept that an interrogative embedded by *tell* carries with it veridicality and exhaustiveness, which we do in most cases,[5] with Karttunen, and if an interrogative embedded by *ask* or by *QUE* is identical to this

[4]The answerhood criterion is presented according to the style of Karttunen. Nothing hinges on this.

[5]See chapter 7 for refinement of the notion of exhaustiveness required.

denotation, then Karttunen's basic idea is sound. However, we have already seen that there are varied grounds that require one to give up the assumption that the interrogative denotation is univocal. This means that the more intuitive position, namely that responses do not carry truth or exhaustiveness as part of their *semantic* force can be maintained.

2.2.5 Coordination

An additional problem with the supra-propositional approach is coordination. Groenendijk and Stokhof 1989 go to some lengths to show how type-shifting can and must be used to provide adequate accounts of conjunction and disjunction in supra-propositional approaches. Although they use this as motivation for an expansion in permissible type shifting operations, this suggests an intrinsic deficiency of any of the Hamblin/Karttunen/Groenendijk and Stokhof denotations, which is of a different nature from the problems besetting the relational approach: in the latter case, a unary wh-question, for instance, just cannot be conjoined or disjoined with a multiple wh-question without type shifting of some kind. In the Hamblin/ Karttunen/Groenendijk and Stokhof approach, it *can* go through, but leads to wrong results. Hence, the need for type shifting.

Consider first conjunction. As pointed out by Groenendijk and Stokhof, on the usual extension of 'and' to set-like denotations, namely intersection, many interrogative denotations turn out to be necessarily *empty*. This is unfortunate both because *empty* is the kind of denotation one expects for certain pathological sentences and it needlessly identifies the meanings of sentences that without question should be distinct. Thus, in every use in which each pair of conjuncts denote distinct propositions, the following coordinations, unintuitively, denote the empty set of propositions:

(188) a. Does Mary like Bill and is that an unsettling state of affairs?

b. Did Ming leave yet and did he leave his affairs in order?

Groenendijk and Stokhof point out the fact that a compound disjoined question appears to be able to elicit responses that can indicate more than one true and complete answer, as exhibited in (11b,d) repeated here:

(189) a. Who left last night or is Jill annoyed now for no reason?

b. Bill left though I don't believe Jill is annoyed.

c. It's not known at present.

d. Well I would guess that Jill's best friend left.

e. Many important people left and probably Jill is quite annoyed now.

(190) a. Who committed the crime or why was your uncle out of his office?

b. Look, my uncle does not work during weekends, so it's quite usual for him to be away.

c. I would accuse Max Cosgrave.

d. I would accuse Max Cosgrave. Afterall my uncle does not work during weekends, so it's quite usual for him to be away.

Recall that we argued that the explanation for this was simply a consequence of the exclusive implicature inherent in the meaning of 'or'. This is defeasible, which accounts for the possibility of responses that provide an answer for each disjunct.

(191) a. Who likes Bill or who likes Mary

b. λ p [TRUE(p) $\wedge$ $\exists$ y (p = LIKES(y,bill))] $\cup$ λ p [TRUE(p) $\wedge$ $\exists$ y (p = LIKES(y,mary))]

The plausible way to interpret disjunction for Karttunen denotations (namely set union) provides for the resolving answer to the *conjunction*, rather than providing for more than one resolving answer. Similar remarks apply to the Groenendijk and Stokhof account. Groenendijk and Stokhof, for their part, take the possibility of multiple true and complete answers for disjoined interrogatives as motivation for assuming that such interrogatives must differ in type from what they call 'atomic

interrogatives'.[6] This seems like the unavoidable conclusion to draw in terms of their and Karttunen's approach to answerability. But the conclusion this suggests is not a happy one for that approach. It is entirely an *artefact* of the modelling, and has no independent correlate: beyond the awkwardness inherent in a multiply coordinated structure, there is nothing unusual about conjoining an 'atomic' interrogative with a disjoined one:

(192) Why is Bill annoyed or is it the case that he suffers from random facial seizures, and when is his next medical check-up.

Similarly, disjoined interrogatives have an identical distribution to 'atomic' ones and so on. None of this comes as a surprise to Groenendijk and Stokhof, of course. Indeed they advocate that interrogatives need to flexibly shift among various types for precisely such reasons.[7] The price that is paid is a significant weakening of the explanatory power of the underlying type theory.

2.2.6 Identity conditions

Hamblin's approach cannot differentiate between a wh-question and an alternative question listing the possible instantiations of that question, assuming restrictions on interrogative phrases are viewed as restricting the set of instantiators to entities satisfying the restriction. For instance:

(193) a. Which ex-president residing in California during 1991 is a cold-warrior?

b. Is Nixon a cold warrior or is Reagan a cold warrior?

[6] Hamblin and Bennett and Belnap's amendation of Karttunen are not forced into this conclusion, but still run into problems with respect to conjunction.

[7] An additional reason they cite is the need to generalise entailment to apply, among other expressions, also to interrogatives.

This, *pace* Peters 1978,[8] seems a *disadvantage*: one who does not know who the property *ex-president residing in California* applies to, cannot respond usefully to the wh-query, though she might easily be able to respond to the alternative query.

Similarly, unless Hamblin allows for sortally illicit instantiations he cannot distinguish wh-questions whose instantiation sets are identical. For instance:

(195) a. Which males over there are bachelors?

b. Which humans over there are bachelors?

c. λ p [$\exists$ y Male-over-there(y) $\wedge$ (p = IS-A(bachelor,y))]

d. λ p [$\exists$ y HUMAN-over-there(y) $\wedge$ (p = IS-A(bachelor,y))]

We have already seen the even more serious problems faced in terms of individuation by Karttunen and Groenendijk and Stokhof.

2.2.7 Construal

The supra-propositional approach faces a construal problem: if interrogatives are taken to be constituted of sets of propositions that constitute the answers to interrogatory uses of the sentence, then, regardless of the cognitive plausability of the underlying propositional space, the interrogative denotation is implausible as an object of querying. This is because, as a general rule, a querier does not have direct access to the possible answers his queries can elicit. This is most obvious in the case of wh-questions, but as we have seen in section (1.5), it applies equally to yes/no and alternative questions, when we examine the full range of answers that felicitous responses to them can convey.

[8] Peters' own example is slightly more plausible:

(194) a. Which of his parents' does John like?

b. Does John like his father or his mother?

That these can differ is suggested by the fact that in a polygamous society, the paraphrase might need altering.

We therefore question whether the approach captures a sensible folk *intuition*, namely 'that "questions denote their answers"' (Hausser 1983, p. 127): certainly not in *my* local Safeway it ain't.

It is *not* the case that there is no way out of this problem, there is, but adopting it means abandoning the basic intuition behind the supra-propositional approach, namely that interrogatives supply answerhood conditions without appeal to a non reductively construed open-proposition-like object.

One characteristic of wh-questions is that they can be used without acquaintance with (virtually) any of the (singular) answers they can evoke. This is, in fact, one of their distinct advantages, although it does make them somewhat more complex cognitively. Consider, for example, the following sentence

(196) What is the word for 'relaxation' in Chukotian ?

uttered by someone such as the current author who doesn't know what language family Chukotian belongs to, let alone possible word forms in the language. Clearly, I can ask this question without reference to or acquaintance with *any* singular proposition which instantiates an answer. Similarly, with respect to comprehension, though not, of course, ability to provide a true answer—conveying response.

Thus, successful communication involving a wh—question need not make any reference to potential singular instantiations constituting answers. Consider an exchange wherein one phones a knowledgeable travel agent, who has heard of just about all airlines, and asks her 'Where does Air Bhutan fly to ?'. She clearly understands the question, since after searching for half an hour in the basement, she can provide you with an answer out of their 1968 brochure. In fact, the travel agent did not antecedently have any idea of where Bhutan actually is. Does this force us to say that she understood the question only after her supervisor informed her that Bhutan was in South Central Asia, whence possible destinations became available to her ? This seems rather implausible.

None of this should be particularly novel or controversial. A path resembling this one has been trodden before. Quine, in his later work, has cogently argued for the need for an objectual construal of quantification, one that views quantification as

describing relations that hold between types (or attributes) of entities. ('Every dog barks' means that doghood is a subattribute of 'being a barking producing entity'.), rather than a substitutional construal ('Every dog barks' means 'x barks' is true for any dog instance d_0)[9] He argues that in terms of the ontogenesis of a language system it is quite likely that a substitutional construal is prior, but that the language user must ultimately make the (discontinuous) transition to an objectual semantics. After all, not every grain of sand can and should be named, and yet, presumably, the sentence 'Every grain of sand is made of quartz' presents no inordinate difficulty.

So, the question arises—is there an objectual construal of 'the set of all possible answers' that would resolve the cognitive quandary a substitutional construal of it poses ? We offer a plausibility sketch that if an objectual construal of this set exists, then what it amounts to is an object that non-reductively makes reference to an open-proposition-like object.

Assume as given a wh-question $q(x)$ that has some role r interrogated. We are supposed to provide a 'schematic' construal of the set of (singular) answers of this question, one that does not make reference to particular instatiations of $q(x)$. Presumably, this will consist in filling the role r with some prototypical filler, or equivalently, viewing r as filled by an unspecified type of some kind. But, whatever the precise details, this representation does not have as constituents any actual singular propositions, instantiations. Rather, it utilises a content in which r contains a variable of some sort, or alternatively, is simply unfilled.

Of course, quite different, perfectly sensible epistemic construals might be argued for such sets, perhaps using a slogan like 'the uncancelled options'. Approaches that adopt such a slogan, however, cannot see themselves as providing semantic objects that presume to pertain to the actual use of interrogative sentences as queries.

[9]See Quine 1974 for extensive discussion of this problem.

Chapter 3

Questions as Unresolved SOAs

3.1 Introduction

In chapter 1, we saw a host of properties that need to be satisfied by a semantic object that can serve as the content of a use of an interrogative sentence. These can be summarised as follows:

- Answerhood: any interrogatory use of an interrogative sentence gives rise to a (context independent) relation of answerhood that holds between the content of felicitous responses to the query and the (descriptive) content of the query.
- Systematic ambiguity: interrogative sentences manifest a systematic ambiguity between a question-like content on the one hand: this serves as the descriptive content of a query and is embedded by (the relations denoted by) verbs such as *ask* or *wonder*. The other type of content it provides is propositional: this is embedded by (the relations denoted by) *know* or *tell*. This object manifests strong veridicality properties.
- Binary operations: standard propositional operations such as conjunction, disjunction and conditionalisation apply productively to interrogative and declarative sentences, separately and together. Exclusiveness and relevance conditions between the juncts that hold for propositional disjunction and conditionalisation continue to hold for interrogative coordination.

We have seen that previous approaches have not managed to provide semantic objects that combine all these properties without running into various other problems. The N-ary relational approach can provide an adequate theory of answerhood but at an unacceptable price: no plausible definition of binary operations can apply to the proposed semantic objects, since interrogatives differing in r-ity and argument type denote objects of semantically different types. Moreover, the approach makes predictions about the mapping between syntactic and semantic categories that are either obviously false or require making entirely unmotivated syntactic category distinctions.

The supra-propositional approaches, on the other hand, do not run into the problem of uniformity. However, the theory of answerhood they provide is too restrictive. Question/resolving answer interrogative distinctions are either not made or predict that the question interrogatives are inherently individuated with finer grain: a prediction that is clearly refuted. Moreover, the factivity property of the resolving answer is not captured. Binary operations can be extended to interrogative sentences but only with the aid of various otherwise unmotivated type-shifting operations. The approach predicts that interrogatives are individuated no more finely than their instantiations, a prediction that is not supported by the data. Finally, the proposed denotations face a serious construal problem as objects of querying, given the fact that invariably a querier cannot be acquainted with or specify the answers to the question that can be conveyed. It is not clear how to resolve this problem without appealing to an underlying non-reductively construed open proposition which the answers are described as pertaining to.

As mentioned in the introduction, we propose to develop a fairly common intuition concerning what questions are, as enunciated by Jespersen in the quote we provided. The task ahead is how to make semantic sense of a Jespersen's idea of an 'unknown quantity' associated with an argument role: we show that this can be done in a way that explicitly avoids using variables as semantic objects.[1] Our first task is introducing the notion of propositional entity on which our account is based.

[1]Although, given the existence of situation theoretic models in which 'variable-like' entities, parameters, are first class citizens, one can also profitably conceive of the objects we use as equivalence classes of parameter containing objects. This will become clear below.

3.2 States of Affairs

Our theory is framed within a class of 'Russellian' or 'singular' proposition theories. Such theories assume as given a set of entities, basic ('simplex') relations, and argument roles of these relations all taken as primitive irreducible notions. From these primitives, states-of-affairs (SOA's), that constitute the propositional entities of the approach are constructed: these consist of a relation and a (partial or total) assignment of entities to the argument roles of the relation. In turn, from these SOA's, by means of an abstraction operation over unassigned roles, new, 'derived' relations are formed. By assigning entities to the argument roles of these derived relations further SOA's are created, and so forth.

This approach originates with Russell and has recently gained renewed interest particularly for purposes of cognitive representation through works such as Kaplan 1977, Soames 1987, Richard 1983, as well as a host of works in situation theory originating with Barwise and Perry 1983, and developed in Barwise and Etchemendy 1987,1990, Devlin 1991, and modelled by Westerstahl 1990, Fernando 1991, Aczel 1990, Aczel and Lunnon 1991. Our own conception and exposition derives from the situation theoretic perspective. Our parameter-less conception draws extensively on Crimmins' recent work on a parameter-less theory of SOA's (Crimmins (to appear)).

3.2.1 basics

What is a SOA? A useful intuition is this: in describing the world agents observe events or states and objects in them, and package these into discrete units. Each basic unit consists of some entities and a relation that relates them. The basic units can be compounded to form more complex units. These units are essentially *structured*, so that two units that have the same objects and relations in them will not be identical unless they are built up using identical structuring. So, just as sentences in Natural Language do not intuitively carry the same meaning even if they have the same basic components, for instance active and passive sentences, so it is with informational units used to describe the world. By the same token, saying that units with identical components but different structure *are* non-identical, does not mean that these objects

are unrelated. They are related in that they describe information that cannot be incompatible, even if it is, as it were, presentationally distinct.

So, SOA's are structured objects whose direct constituents are a (main) relation and a set of entities assigned to (some, possibly all) the argument roles of the relation. More precisely, such objects are individuated by a main relation and a (possibly partial) assignment of entities to the argument roles of the main relation. For instance:

(197) a. ⟨ **LIKE, liker:jill, likee:bill** ⟩

b. ⟨ **HOT, location: cordura-hall, time: 3:45 pdt** ⟩

c. ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:–** ⟩

d. ⟨ **GAVE, giver: ming, recipient:–,object-exchanged:–** ⟩

In (197) we see depictions of SOA's, the first two are *resolved* SOA's, ones in which every argument role has been assigned an entity. In the latter two examples, the (depicted) SOA's are *unresolved*, one or more argument roles has not been assigned an entity, which case we depict with a '–'. We emphasise that these are solely *depictions* of SOA's, because SOA's are taken to be non-linguistic (abstractions), individuated in terms of real-world (or fictional, if the need arises.) objects. They are not sentences in a formal language, though some of them can be profitably be thought of as contents of uses of sentences. In particular, in the case where an argument role is not assigned an entity, which we depict with 'arg-role:–', the '–' has no status as an object: it simply indicates that the assignment function associating entities with argument roles is undefined on that argument role. We use bold-face type when we wish to emphasise the non-linguistic nature of entities.

Nonetheless, it is important to emphasise that even in the case where an argument role does not get assigned an entity, that *argument role* is in the domain of the assignment function, and so is a constituent of the SOA. What the unfilled role contributes are presuppositions on what can count as a unit of information that subsumes the unresolved SOA:

(198) ⟨ **GAVE, giver: ming, recipient:–,object-exchanged:–** ⟩

Thus, even though the SOA depicted in (198) has no entities assigned to the **recipient** and **object-exchanged** roles, the SOA carries with it the information provided by the selectional restrictions on each role, for instance that a recipient can only be human. In other words, this unresolved SOA carries with it information that could be used to infer that (199a), but not (199b) is a SOA with information that subsumes it:

(199) a. ⟨ **GAVE, giver: ming, recipient: mikki, object-exchanged: 5 shekels** ⟩

b. ⟨ **GAVE, giver: ming, recipient: Statue-of-liberty, object-exchanged: 5 shekels** ⟩

The 'SOA' depicted in (199b) brings us to one important issue concerning what pairings of relations and assignments of entities to argument roles actually yield SOA's: we explicitly assume that only the assignments of entities to argument roles that satisfy the appropriateness restrictions the argument roles bring with them when paired with the main relation define SOA's. So, since the depiction in (199b) fails to meet the restrictions on **recipient's** is not assumed to provide for a depiction of *any* SOA. This reiterates the fact that SOA's are not forms, but assumed to embody some kind of external coherence.

Furthermore, were we to assume that any pairing of an assignment and a relation could define a SOA, we would be lead to inconsistency, as exemplified most clearly by the Grelling property ('is a non-self-applicable property'). This property neither holds of itself, nor does not hold of itself.

In light of this discussion, we will make one enrichment of the notion of SOA: we allow restrictions or presuppositions to be imposed on argument roles additional to the ones imposed by the relation. For instance,

(200) a. ⟨ **LIKE, liker:–**$_{AMERICAN}$ **likee: jill** ⟩

b. ⟨ **LIKE, liker:–, likee:jill** ⟩

The sole difference between the SOA's depicted in (200a) and (200b) is that the former carries with it an additional restriction on the unfilled **liker** role: in addition to the usual appropriateness restrictions on **liker's** (have to be animate etc), any SOA that subsumes this unresolved SOA in that the **liker** role is filled (or quantified over) must be one where the filler is AMERICAN. So (201a) informationally subsumes (200a), but (201b) does not:

(201) a. ⟨ **LIKE, liker:George Bush likee: jill**: ⟩

b. ⟨ **LIKE, liker: Edward Shevardnadze likee: jill**: ⟩

We now move to see the motivation for resolved and unresolved SOA's.

3.2.2 Resolved SOA's

A resolved SOA can be used to describe the world as being a certain way: take (197a). It is an informational unit pertaining to **Jill's liking Bill**, for two persons, Jill and Bill. An agent conducting observations on current likings, if his observation is non-distorted, accurate etc will use this unit in his records if and only if it is indeed the case that **jill likes bill**. Similarly, this unit can be used to represent claims: which claim? The claim that the world is such that **jill likes bill**. One which is verified, and will be called true if indeed it is the case that **jill likes bill**.

In order for a SOA to be usable as a description of the world or for representing a claim it must be *resolved*: every argument role has to be assigned an entity:

(202) ⟨ **LIKES, liker:jill, likee:–** ⟩

In (202) we see a depiction of an unresolved SOA. If someone used this to describe an observation, the retort would be 'You didn't get a value for that likee argument, so we cannot go and verify your result.' Similarly, (the descriptive content of) no claim could correspond to this SOA, because **jill** hasn't been claimed to like anyone. (Nor, not to like anyone.)

In general, for a relation R endowed with a set of argument roles $r_1, r_2, \ldots, r_n$, when appropriate objects $a_1, a_2, \ldots, a_n$ are assigned to all the argument roles of a

relation R an issue arises: do these assigned objects stand in the relation R or do they not. The former possibility is denoted by the *infon*

$$\langle \text{R}, r_1 : a_1, r_2 : a_2, \ldots, r_n : a_n \; 1 \rangle,$$

while the latter possibility is denoted by the SOA

$$\langle \text{R}, r_1 : a_1, r_2 : a_2, \ldots, r_n : a_n; \; 0 \rangle,$$

We follow the established convention of omitting the *polarity* '1', where no confusion can arise.

In situation theoretic approaches, the factuality of an infon is determined by some situation, that is, if the possibility represented by some infon σ is realised, there must be some real situation s in the world which supports the factuality of σ: this is denoted

$$s \models \sigma$$

To recap, if the SOA is resolved, in other words the function assigning entities to argument roles is total, only then will the issue of the factuality of the SOA can arise, either directly (in theories that do not make SOA/proposition distinctions.) or as a coargument with a situation of the $\models$ relation (in situation theoretic approaches. The SOA can in such a case be used to describe or represent claims about the world.

3.2.3 *Un*-resolved SOA's

So far, we have shown what use can be made of *resolved* SOA's. But unresolved (or in related conceptions *partial* or *parametric*) SOA's, ones in which not all argument roles are assigned entities also have their uses, it just so happens that describing the world or representing claims are not among them. Recall by our discussion above that an unassigned argument role is still a *constituent* of the SOA, since it is in the domain of the (in this case *strictly* partial) assignment function mapping entities to argument roles.

Consider again an agent making observations. She might have grounds that lead her to a description that is unresolved in some aspect: so in hope of making that

observation more definite at a later point she records it leaving that aspect unresolved. For instance, if there are certain indications that **zhang** is annoyed by some inanimate *thing*, not definite enough even to support an observation existentially quantifying over the object of annoyance, she could decide to leave the issue unresolved. Recording the following:

(203) ⟨ **ANNOYED-AT, annoyed-person:zhang,**
object-of-annoyance:$-_{INANIMATE}$ ⟩

This SOA is unresolved with respect to the *object-of-annoyance* argument role, which is further restricted by an appropriateness restriction of *inanimacy*. So, it can be used to represent an inconclusive observation. Also the content of a *query*. Which query? Roughly, the query **what is zhang annoyed at**. The recipient of the query needs to return a *resolved* SOA, appropriately related (by the answerhood relation) to the unresolved SOA he is provided with.

Notice that, on this line, just as a description or a claim can only be made with a *resolved* SOA, both a query and an inconclusive observation can be made only with an *unresolved* SOA. If the following were provided as evidence of an unresolved observation,

(204) ⟨ **ANNOYED-AT, annoyed-person:zhang,**
object-of-annoyance:ming ⟩

the retort would be 'Sorry, it looks quite resolved to me: Zhang is annoyed at Ming and that's that.'

Further examples of unresolved SOA's and rough descriptive contents they pertain to:

(205) a. ⟨ **LIKES, liker:bill, likee:**$-_{HUMAN}$ ⟩ ('Who does Bill like'.)

b. ⟨ **LEFT,leaver:**$-_{HUMAN}$**,departure-time:12 p.m.** ⟩ ('Who left at 12 p.m.')

Thus, in (205a), we depict the unresolved SOA whose main relation is **LIKE**, whose **liker** role is filled by **bill**, and whose **likee** role is unfilled, and further restricted only to apply to human entities. (Roughly, the descriptive content of a use of 'Who does bill like'.) Similarly, in (205b), we depict the unresolved SOA whose main relation is **LEFT**, whose **leaver** role is unfilled and restricted to humans and whose temporal argument is filled by the time **12 p.m.**. (Roughly, the descriptive content of a use of 'Who left at 12 p.m.')

Before we continue to see further uses for unresolved SOA's in building up 'derived' relations by abstraction, we reemphasise the saturated nature of unresolved SOA's.

3.2.4 Unresolved SOA's as saturated objects

We have already stressed at several points that an argument role of a relation to which no entity is assigned is a constituent of the unresolved SOA since it is in the domain of the argument-role/entity assignment function. Thus, all SOA's, resolved or with one or more unassigned argument roles, are saturated objects, conceived of as entirely distinct from relation-like objects. Nonetheless, as we shall soon see, unresolved SOA's can be abstracted over to derive relations. Whereas a relation can be used to relate objects, an unresolved SOA cannot. A SOA, resolved or unresolved, is a saturated object, whereas a relation is always *unsaturated.* The one distinguishing property of a resolved SOA is that factuality applies to it: the SOA is factual if and only if the relation holds between the entities assigned to the argument roles.

There is an alternative way to conceive of unresolved SOA's which can be useful as a means of grasping their saturated nature. That is as resolved SOA's, some of whose roles are parametrised: each argument role gets assigned an entity, but some roles only get assigned place holders. So, in the above case, we would end up with a SOA which we would depict as follows:

(206) ⟨ **ANNOYED-AT, annoyed-person:zhang,**
object-of-annoyance:x ⟩

So this depicts a SOA in which the **object-of-annoyance** argument role did get assigned something. What? A place holder. Thinking of unresolved SOA's in this

way fits in with the intuition that although no actual entity has been assigned that argument role, it has nonetheless been 'taken heed of', 'closed off' 'marked out' etc. We have to be a bit careful, however, if we take this tack: SOA's are assumed to be individuated by the main relation and the assignment of entities to argument roles. Hence, strictly speaking, the following will be taken to depict a SOA non-identical to that depicted in (206):

(207) ⟨ **ANNOYED-AT, annoyed-person:zhang,**
object-of-annoyance:y ⟩

In (207), the **object of annoyance** argument-role is filled with the place-holder **y**, distinct from **x**. Of course, we are not interested in the identity of the place-holder, what we care about is that something holds the place, regardless of what. The problem seems less worrisome when such objects are used as constituents of abstraction. But this is only because in such cases abstraction is explicitly postulated to be indifferent to the identity of the variables over which the abstraction takes place. In order to avoid this problem, we can decide to ignore identities of place-holders, in other words work only with equivalence classes of SOA's, relative to an appropriate relation of ignoring unnecessary distinctions among place holders. This would not affect the resolved SOA's, since none would get identified that were not identical previously.[2]

Our original discussion of unresolved SOA's, in terms of partial assignments of entities to argument roles, avoids this complication, and we shall revert to it henceforth. The reason for this digression is to make clear the intended *saturated* nature of unresolved SOA's. Hence, quite different SOA's will be needed to represent other notions pertaining to more *syntactic* unsaturation, for instance the various optionality argument roles can come in: 'John ate' v. 'John won', but also non-linguistic cases like people unattuned to time-zones etc.

[2]And sloppiness of language when talking about the relata of equality has been tolerated here, in the interests of avoiding verbosity.

3.3 Resolution, abstraction and derived relations

The approach to semantic modelling we are working within assumes as given primitives a set of entities and *basic* relations and argument roles. Intuitively, these basic relations can be thought of as denotations of simplex expressions such as verbs or simple determiners. But the approach is definitely not committed to the assumption that *all* relations and properties are given as irreducible primitives. Rather, the idea is that once a set of basic SOA's is constructed from the basic relations and entities, these SOA's can be used to derive a further class of relations by *abstraction*, where abstraction is an operation that derives a relation from an unresolved or parametric SOA.

In fact, providing *derived relations* for the semantics of quantification is one of the original motivations for postulating unresolved or parametric SOA's, see e.g. Gawron and Peters 1990a, who use parametric SOA's for such purposes, and Crimmins (to appear), whose non-parametric conception we have adopted here.

3.3.1 Derived relations: basic idea

Let us return to our example involving an unresolved observation: the agent initially summed up the state of things with the following SOA:

(208) ⟨ **ANNOYED-AT, annoyed-person:zhang,**
object-of-annoyance:– ⟩

After further work, there are indications, still not leading to a definite conclusion, these concerned **ming being distressed**, though whether there actually existed an object causing his distress or not is unresolved. She now lists her the latest observation with the following SOA:

(209) ⟨ **DISTRESSED, distressed-person:ming,**
object-of-distress:– ⟩

Finally it turns out that a single person is both the cause of **zhang's annoyance** and the cause of **ming's distress**, none other than **jing**. Now the agent's initial unresolved observation turns out to have been resolved as follows:

(210) ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:jing** ⟩

(210) depicts a resolved SOA, which we shall say *resolves* or is a *resolution* of the SOA depicted in (208). Similarly, the agent can describe the world as being the following way, resolving the other previously unresolved possibility:

(211) ⟨ **DISTRESSED, distressed-person:ming, object-of-distress:jing** ⟩

The agent could combine her observations using a compound SOA:

(212) ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:jing** ⟩ ∧ ⟨ **DISTRESSED, distressed-person:ming, object-of-distress:jing** ⟩

We know something about **jing** that we previously did not necessarily think one person could manifest: he both made **zhang** annoyed, as well as causing distress to ming. Now the SOA depicted in (212) describes this fact very well, but for future reference we might want to have a property that anyone who was like **jing** would be said to bear. It might turn out that the property of 'being someone who made zhang annoyed and caused distress to ming' is one that is identifiable in the basic stock of relations we started out with, but in case it isn't (and there will conceivably be such cases), we can use the original unresolved SOA's to form a new, derived property, it has one role which we have labelled 'ann-diss-er', which we depict provisionally as follows:

(213) [λ ann-diss-er ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:–** ⟩ ∧ ⟨ **DISTRESSED, distressed-person:ming, object-of-distress:–** ⟩]

Although the labels which we assign to roles created in abstraction are arbitrary, let us introduce the following *notational convention*: unfilled argument roles that are to be abstracted over will be *depicted* as assigned a variable. This variable will then serve as the label for the abstraction operator.

Thus, we redepict the above relation as:

(214) λ x ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:x** ⟩ $\wedge$ ⟨ **DISTRESSED, distressed-person:ming, object-of-distress:x** ⟩

We can use this new property, formed by *abstracting* over unfilled roles in the complex unresolved SOA, in forming SOA's:

(215) ⟨ λ x ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:x** ⟩ $\wedge$ ⟨ **DISTRESSED, distressed-person:ming, object-of-distress:x** ⟩ x: mike ⟩

This SOA consists of main relation 'being someone who made zhang annoyed and caused distress to ming' and one object assigned to the derived argument role labelled by x, namely **mike**.

Abstraction can also apply to form relations. To form the relation holding between two persons, a and b, if and only if 'a made zhang annoyed and b caused distress to ming', we use the same unresolved SOA as above, but instead of linking the two roles into one compound role, we leave them separate:

(216) λ x,y ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:x** ⟩ $\wedge$ ⟨ **DISTRESSED, distressed-person:ming, object-of-distress:y** ⟩

This compound relation can be used to form a compound SOA, as before:

(217) ⟨ λ x,y ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:x** ⟩ $\wedge$ ⟨ **DISTRESSED, distressed-person:ming, object-of-distress:y** ⟩ **x: millie, y: maxine** ⟩

3.3.2 Derived relations and quantification

We can now understand how unresolved SOA's relate to quantification: what quantification involves is relation or properties that hold between derived relations. Unresolved SOA's help us get at derived relations and properties. Thus, a schematic content for (a use of) (218a) is provided in (218b):

(218) a. Zhang likes some person.

b. ⟨ **SOME, PERSON,** λ **x** ⟨ **LIKES, liker:zhang, likee:x** ⟩ ⟩

In similar fashion, we provide a content for linear scoped (use of) (219a) is provided in (219b):

(219) a. Every tiger likes some fish.

b. ⟨ **EVERY, TIGER,** λ x ⟨ ⟨ **SOME, FISH,** [λ y ⟨ **LIKES, liker:x, likee:y** ⟩ ⟩

3.3.3 Set theoretic lambda abstraction and reduction

The notation we have used for relation derivation is, not coincidentally, reminiscent of λ-calculus notation. There are a number of formal resemblences between the two, but it is also important to be aware of the differences.

λ-calculus provides a description language for functions. This language also has models, though in the case of the untyped version of the language, these require highly intricate topological constructions, given that the objects constructed are functions that can apply to themselves as arguments. In model theoretic semantics based on set theory where the combination of expressions is restricted by some kind of type theory, the role of the λ-calculus is to provide terms for sets. Thus,

λ x(LIKES(x,j))

although distinct as a term from

λ x,y(LIKES(x,y))[j]

labels the same set theoretic object, namely the set of 'things that like j'. Hence λ-abstraction is not *productive* semantically, it does not create new relations.

This is different from the notion of abstraction we have been appealing to, where the abstraction derives relations that did not exist in the initial stock of primitive

relations. We will not enter here into the question of how such an operation is modelled mathematically, see e.g. Westerstahl 1990, Fernando 1991, Aczel 1990, Aczel and Lunnon 1991.

Nonetheless, the derived relations are intended to be related to the objects from which they are constructed. How these relationships are captured depends on specific versions of theories of SOA's. In situation theory, such relationships are captured by means of the notion of informational *constraints.*[3] Regardless of how precisely these links are established, this means that we have notions of equivalence formally resembling the β-reduction of λ-calculus. Thus, although the following SOA's are distinct since they are constructed of distinct relations, and assignment functions, the information they describe that cannot be incompatible:

(220) a. ⟨ **LIKE, liker:Ann, likee:Ann** ⟩

b. ⟨ λ x ⟨ **LIKE, liker:x, likee:x** ⟩ x: Ann ⟩

The relation depicted by λ x ⟨ **LIKE, liker:x, likee:x** ⟩ is a derived relation, intuitively 'being a self liker', analogously to the fact that in the conceptual scheme underlying English, apparently this is not a simplex concept. Nonetheless, the SOA in which this relation applies to Ann can never provide for a description of the world that would be incompatible with a description using the two place relation 'LIKE'. This does not mean that as informational units these SOA's need to be assumed to be identical. Thus, the underlying semantic ontology we adopt here is committed to the position that information can be individuated more finely than truth conditions.

By the same token, we revise slightly the contents of uses of wh-interrogative-sentences in a way that takes account of the fact that wh-phrases are, typically, focus-bearing expressions whose scope can vary. All this will involve is a 'lifting' of the contents provided:

(221) a. ⟨ **ANNOYED-AT, annoyed-person:zhang,**
object-of-annoyance:-*INANIMATE* ⟩

[3]See Devlin 1991 for discussion.

b. ⟨ λ x ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:x** ⟩ x:−*INANIMATE* ⟩

Full motivation for this move will be provided in chapter 4. Notice though that the new and old unresolved interrogative contents are necessarily equivalent. For any resolution of the lifted SOA, there exists a necessarily equivalent SOA that is a resolution of the unlifted SOA:

(222)

⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance: taxes** ⟩

⟨ λ x ⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:x** ⟩ x: **taxes** ⟩

Since the current chapter is concerned solely with contents, not with assigning meanings to sentences, and since for current purposes the two contents are equivalent, we ignore the need for the distinction in the current chapter, and stick with the simpler, unlifted contents.

Summing up: we have indicated schematically how to use unresolved SOA's to form complex relations and properties. These in turn answer various needs, not least in providing contents for quantified sentences. Thus, unresolved SOA's although, on the current presentation, are motivated by concerns of *irresolution* and *querying* are also needed for entirely different but central purposes.

3.4 Unresolved SOA's and interrogative denotations

We can now return to our interrogatory concerns and show how to account for the various properties an interrogative content must satisfy. We first run through the basic idea, providing the details in the following sections.

3.4.1 Answerhood

We assume that the content of a query is an unresolved SOA. Intuitively, the responder is provided with the unresolved SOA by the querier. She is supposed to provide a response whose content conveys an answer of the given unresolved SOA. What SOA's are answers of a given unresolved SOA? Simply this: either resolutions of that SOA (instantiated answers) or quantifications over the unassigned roles of the SOA (quantified answers):

(223) a. Who does Zhang like?

b. ⟨ **LIKE, liker:zhang, likee:–** ⟩

c. Zhang likes Jill

d. ⟨ **LIKES, liker:zhang, likee:jill** ⟩

e. Zhang likes some person

f. ⟨ **SOME, PERSON,** λ **x** ⟨ **LIKE, liker:zhang, likee:x** ⟩ ⟩

So assuming the contents of queries to be unresolved SOA's provides for a direct, simple and adequate notion of answerhood. The answerhood relation that we define as a relation between SOA's of all kinds, resolved and unresolved turns out to have some potentially interesting properties beyond its applicability to explicate query/response patterns.

3.4.2 Construal and Individuation

Notice that the proposed contents face no cognitive construal problem: cognizing the object of query requires no access to the possible fillers of the unassigned role: the unresolved SOA is not reductively constructed from its resolutions.

For this reason, we run into none of the individuation problems faced by supra-propositional approaches. Consider, for instance,

(224) a. Which ex-president residing in California during 1991 is a cold-warrior?

b. Is Nixon a cold warrior or is Reagan a cold warrior?

On any interrogative use these have the following schematic contents:

(225) a. ⟨ IS-A, property-of-predication:COLD-WARRIOR, pred-role:$-_{EX-PRESIDENT-RESIDING-IN-CALIFORNIA}$ ⟩

b. ⟨ MODALITY-PROPERTY:− ⟨ IS-A, property-of-predication:COLD-WARRIOR, pred-role:**reagan** ⟩ ⟩ ∨ ⟨ MODALITY-PROPERTY:− ⟨ IS-A, property-of-predication:COLD-WARRIOR, pred-role:**nixon** ⟩ ⟩

The alternative question, which we have argued to be a disjoined yes/no question in section (1.5.4), receives a content quite distinct from the wh-question. The content of the latter does not have either **nixon** or **reagan** as constituents. In fact, it has no entity associated with the predicated role, simply a further restriction on possible fillers of the argument role.

Similarly,

(226) a. Which male over there is a bachelor?

b. Which human over there is a bachelor?

On any interrogative use these have the following schematic contents:

(227) a. ⟨ IS-A, predicating-property:BACHELOR pred-role:$-_{MALE}$ ⟩

b. ⟨ IS-A, predicating-property: BACHELOR, pred-role:$-_{HUMAN}$ ⟩

These SOA's differ in the additional restriction introduced by the interrogative phrase that is placed on the argument role of predication. In the one case the unassigned argument role is further restricted to male entities, in the other case, the restriction is to human entities. Since the interrogative denotation is not constituted of instantiations, the information provided by the restrictions on who can fill the interrogated role is not lost.

3.4.3 Uniformity and compounding

We do not run into the uniformity problem since all SOA's, resolved or unresolved, are saturated objects of the same semantic type: strictly speaking, a pair consisting of a relation and an assignment function of entities to argument roles. It is, hence, straightforward to define binary operations simultaneously on all SOA's: a compound SOA will be unresolved, unless *both* its juncts are resolved, in which case the issue of its factuality can arise. The unfilled roles are, naturally enough, the union of the unfilled roles from each junct's main relation. A resolution of a compound SOA will be any identically compounded SOA each of whose juncts are resolutions of the juncts of the unresolved compound SOA. For instance, (228b) is a resolution of the unresolved compound SOA in (228a):

(228) a. ⟨ ∧ ⟨ **LIKE,liker:bill,likee:–** ⟩, ⟨ **HATE,hater:–,hatee:jill** ⟩ ⟩

b. ⟨ ∧ ⟨ **LIKE,liker:bill,likee:minnie** ⟩, ⟨ **HATE,hater:daryl,hatee:jill** ⟩ ⟩

3.4.4 Question/Resolving answer distinctions

Providing for the question interrogative meaning is straightforward: on any use, it is simply the query denotation, an unresolved SOA. Felicitous responses have contents that are related by the *Answer* relation to the descriptive content of the query. This is reflected presumably in the ability to report any felicitous response using the paraphrase 'Indication of/about'.

How to provide for the strong veridicality properties of the resolving answer meaning is a more intricate issue and forms the main topic of chapter 7. Roughly, it will be a description for a SOA that has the property of being a complete and factual resolution of the unresolved SOA provided by the question denotation. The mapping associating (a meaning specifying) an unresolved SOA to (a meaning specifying) a description for a maximal resolving SOA is 1-1, and hence there is no loss in ability to individuate question from resolving answer interrogative meanings.

We now move to see in greater detail how answerhood and binary operations are defined.

3.5 Answerhood

We can now provide for an entirely informational characterisation of the relation 'Answer' that holds between SOA's. Part of the motivation for identifying questions with unresolved SOA's is an intuition that they are sources of (potential) information that just fail to carry information themselves because of an intrinsic *void* they contain. 'Answer' is supposed to capture the range of (potential) information specifiable from a question. It would be natural to expect that for *resolved* SOA's, 'Answer' is a much less specific relation, given that uses of linguistic objects whose contents are resolved SOA's place far weaker restrictions on discourses of which they are constituents. This expectation is met, we believe.

3.5.1 Instantiated answers

The instantiated answers, then, are the resolved SOA's obtained from a question by assigning objects to the unfilled roles of the question:

(229) INST-ANS(σ,q) if and only if RESOLUTION(σ,q).

RESOLUTION relates a resolved SOA σ to any unresolved SOA q whose assignment function is extended by σ's role to entity assignment function.

(230) a. ⟨ **LIKE, liker:bill, likee:**$-_{HUMAN}$ ⟩

b. RESOLUTION(⟨ **LIKE, liker:bill, likee:jill** ⟩,
(⟨ **LIKES, liker:bill, likee:**$-_{HUMAN}$ ⟩)

(231) a. ⟨ **LEFT,leaver:**$-_{HUMAN}$**,departure-time:**− ⟩

b. RESOLUTION(⟨ **LEFT,leaver:millie,departure-time:12 am, 12 Feb 1992** , ⟩,
⟨ **LEFT,leaver:**$-_{HUMAN}$**,departure-time:**− ⟩)

For a *resolved* SOA τ, INST-ANS(σ, τ) holds if and only if $\tau = \sigma$ since τ has no unassigned roles to be resolved.

3.5.2 Quantified answers

QUANT-ANS is intended to relate an unresolved SOA to each of the quantifications over the SOA's unfilled roles. How do we get at all these SOA's? The basic idea is this:[4] quantificational answers are SOA's that entail either a positive (i.e. instantiated) resolution of the issue raised by the unresolved SOA, or a negative resolution of that issue, or in the case of monotone decreasing quantificational forces, compatible with both positive and negative resolutions.

For a SOA q_0, we define INST-ANS-LATT(q_0) to be the lattice obtained by closing the class of SOA's related to q_0 by the relation INST-ANS under SOA conjunction and disjunction, and partially ordered by the usual 'information subsumption' $\geq_{inf}$ that partially orders all SOA's ('entailment').

We define EXIST-RESOLUTION(q_0) to be the greatest lower bound of INST-ANS-LATT(q_0). Intuitively this is the SOA that describes the outcome in which q_0 gets resolved positively, that is if f_0 is the partial assignment function assigning entities to the resolved roles of q_0, while $r_1, \ldots, r_n$ are the unfilled roles of q_0, then there exist $a_1, \ldots, a_n$ such that the assignment extending f_0 and assigning a_i to r_i provides for a factual SOA.

We define NEGATIVE-RESOLUTION(q_0) to be the SOA dual to EXIST-RESOLUTION(q_0) Intuitively this is the SOA that describes the outcome in which q_0 has no factual resolutions.

We can now define the relation QUANT-ANS as follows:

(232) QUANT-ANS(σ, q_0) if and only if ($\sigma \geq$ NEGATIVE-RESOLUTION(q_0) $\vee$ $\sigma \geq$ EXIST-RESOLUTION(q_0))

What is the source of this descriptive condition? It is exactly the negation of a condition for a neutral context for querying, which we discussed in section (1.4.2).

[4] I am indebted to Stanley Peters for the key suggestion that lead to this method of defining the relation.

Thus, for a unary wh-question (content) $q(x)$, QUANT-ANS ends up being (equivalent) to the following definition:

(233) QUANT-ANS$(\sigma, q(x))$ if and only if $(\sigma \geq \forall x \neg q(x) \vee \sigma \geq \exists x q(x))$

Thus, the effect of the utterance of a response providing a quantified answer is to ensure that the context is no longer *neutral.*

This makes clear how different quantificational forces are accommodated: any force either stronger than a pure existential or a pure negative universal entails one of the disjuncts, hence, the disjunction and thus satisfies the descriptive condition. Other forces, most prominently monotone decreasing (e.g. 'few') are accommodated since they entail the disjunction, though *not* each disjunct.

Notice that for a resolved SOA τ, the lattice INST-ANS-LATT(τ) consists solely of τ. Hence, the relation QUANT-ANS reduces to

(234) QUANT-ANS(σ, τ) if and only if $(\sigma \geq \tau \vee \sigma \geq \neg\tau)$

This means that QUANT-ANS relates a resolved SOA to any information either stronger than the resolved SOA or than its dual. Intuitively, in discourse terms, this suggests that the constraints imposed by a resolved SOA on continuation of a discourse are precisely that additional contributions must either serve to further specify existing information or to refute it.

Notice further that for the content of a yes/no interrogative 'Is it the case that p', the relation QUANT-ANS reduces to the case of a resolved SOA: this is because denoting the yes/no content with R(p), where R is an unfilled argument role for a modality, EXIST-RESOLUTION(R(p)) is $\neg p$, and hence its dual is p. We thus derive directly the fact that such interrogative sentences intrinsically specify only instantiated answers, namely various propositional modalities applied to the queried proposition.

One final case to be mentioned are mixed quantificational/instantiated answers, obtained by partially resolving the question and quantifying over the remaining unfilled roles.

(235) MIXED-QUANT-INST-ANS(σ, q) if and only if $\exists\tau$(QUANT-ANS(σ, τ) $\wedge$ PARTIAL-INST-ANS(τ, q))

PARTIAL-INST-ANS relates any unresolved SOA q_0 to any unresolved SOA τ whose role to entity assignment function strictly extends the role to entity assignment function of q_0.

3.5.3 Answerhood defined

Putting this all together, we get:

(236) *Answer*(σ, q) = INST-ANS(σ, q) $\vee$ QUANT-ANS(σ, q) $\vee$ MIXED-QUANT-INST-ANS(σ, q)

The way we have defined answerhood suggests viewing it as a general relation holding on all SOA's: it is most specific on the contents of wh-interrogative sentences, and least specific on uses of expressions whose content is a resolved SOA. Yes/no interrogative sentences turn out to be intermediate cases: they have a specific instantiated answer relation, but their quantified answer relation reduces to that of the corresponding declarative.

3.6 Binary Operations

3.6.1 Intuition

Binary operations such as conjunction, disjunction and conditionalisation can be defined on all SOA's *a priori*, resolved and unresolved. Before providing for a more formal description, let us consider the motivation for this. Imagine our agent conducting observations. Assume she first finds out that the following is a fact:

(237) ⟨ **BROKEN, breaker:jing, broken:zhang's-vase** ⟩

jing has broken zhang's vase. She continues to conduct observations, and concludes that **zhang** might be annoyed at someone. This is not definite, so for the moment she leaves this unresolved:

(238) ⟨ **ANNOYED-AT, annoyed-person:zhang,**
object-of-annoyance:– ⟩

If at this point, she has to 'summarise' her conclusions, can she say she has in some sense a complete description of things? Clearly she cannot. The compound object she has is:

(239) ⟨ ∧, ⟨ **BROKEN, breaker:jing, broken:zhang's-vase** ⟩,
⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:–** ⟩ ⟩

She might summarise things by saying: 'I know jing broke zhangs' vase, but what if anything annoyed zhang?' Or, 'Given that jing broke zhang's vase, what if anything annoyed zhang?'

More generally, combining an resolved SOA with an unresolved one results in a compound unresolved SOA.

We have already discussed a case of conjoining two unresolved SOA's above: the result is a compound unresolved SOA that is unresolved both in the aspects provided by the one conjunct and in the aspects unresolved in the second conjunct. What of disjunction? Intuitively this would correspond to the following: while conducting observations, she narrows her task to one which could lead to two alternative conclusions. She first pursues investigations in one domain, but cannot come up with more than an unresolved description of her conclusions there. For instance, she might, describe this situation with:

(240) ⟨ **DISTRESSED, distressed-person:ming,**
object-of-distress:– ⟩

She then embarks on investigation in the other domain, but cannot come up with more than an unresolved description of that situation, say,

(241) ⟨ **ANNOYED-AT, annoyed-person:zhang,**
object-of-annoyance:– ⟩

She describes her combined endeavours with

(242) ⟨ ∨, ⟨ **DISTRESSED, distressed-person:ming, object-of-distress:–** ⟩,
⟨ **ANNOYED-AT, annoyed-person:zhang, object-of-annoyance:–** ⟩ ⟩

Why? Because as she sees things, although both juncts are unresolved, resolving either of the juncts is all that is needed to get a proper picture of the way things are, though she does not know which junct to resolve.

3.6.2 Formal definitions

To a more formal description of the operations: a compound SOA will be unresolved, unless *both* its juncts are resolved, in which case the issue of its factuality can arise. Compound SOA's containing unresolved juncts will, then, be unresolved. We are interested to know how the relation 'Answer' applies to them. The way we have defined 'Answer' above, already provides for a definition of 'Answer' for a compound SOA once we know what counts as a resolution of such an object.

The unfilled roles are, naturally enough, the union of the unfilled roles from each junct. Given the notion of SOA that we have, and the fact that we wish the operations to reduce to 'ordinary' Boolean operations for resolved SOA's, we do not have much choice in the way we define resolutions of compound SOA's. A resolution of a SOA whose main relation is a binary connective will be a SOA whose main relation is that same binary connective and whose juncts are resolutions of each of the juncts of the unresolved SOA:[5]

(243) RESOLUTION(⟨BINARY-CONNECTIVE,σ_0, τ_0 ⟩,
⟨BINARY-CONNECTIVE,σ_1, τ_1 ⟩) iff $RESOLUTION(\sigma_0, \sigma_1)$ and $RESOLUTION(\tau_0, \tau_1$

Some examples that illustrate this definition:

(244) a. RESOLUTION(⟨ ∧, ⟨ **LIKE,liker:bill,likee:–** ⟩,
⟨ **HATE,hater:–,hatee:jill** ⟩; ⟩, ⟨ ∧, ⟨ **LIKE,liker:bill,likee:minnie** .
⟨ **HATE,hater:daryl,hatee:jill** ⟩; ⟩)

[5] I am indebted to Mark Crimmins for helpful suggestions concerning this issue.

b. RESOLUTION(⟨ → ⟨ **LIKE,liker:bill,likee:minnie** ⟩,
⟨ **HATE,hater:–,hatee:jill** ⟩; ⟩, ⟨ → ⟨ **LIKE,liker:bill,likee:minnie** ⟩,
⟨ **HATE,hater:daryl,hatee:jill** ⟩; ⟩)

Thus, in (244a) we see an instance of a resolution of a conjoined SOA, whose first junct is ⟨ **LIKE,liker:bill,likee:–** ⟩ and whose second junct is ⟨ **HATE,hater:–,hatee:jill** ⟩. A resolution of this conjoined SOA is itself conjoined, its first junct is ⟨ **LIKE,liker:bill,likee:minnie** ⟩, where **minnie** now fills the role previously unfilled in the first junct of the incomplete SOA. The second junct is ⟨ **HATE,hater:daryl,hatee:jill** ⟩, where **daryl** fills the role previously unfilled in the second junct of the unresolved SOA.

3.6.3 Examples

Let us note a couple of specific examples of compound contents that emerge:

Conjunction

(245) a. Who does Bill like and who hates Jill.

b. ⟨ **AND,**⟨ **LIKE,liker:bill,likee:–**$_{HUMAN}$ ⟩,
⟨ **HATE,hater:–**$_{HUMAN}$**,hatee:jill** ⟩

For simplicity, we concern ourselves solely with instantiated answers. The way we have defined RESOLUTION entails that that responses are predicted to convey the following class of instantiated answers:

(246) INST-ANS(σ, a use of ' Who does Bill like and who hates Jill') if and only if σ = ⟨ **AND,** τ, ϕ ⟩, where INST-ANS(τ, ⟨ **LIKE,liker:bill, likee:–**$_{HUMAN}$ ⟩) and INST-ANS(ϕ, ⟨ **HATE,hater:–**$_{HUMAN}$**, hatee:jill** ⟩)

In other words,

(247) INST-ANS(σ, a use of ' Who does Bill like and who hates Jill') if and only if σ = $\langle$ **AND,** τ, ϕ $\rangle$, where INST-ANS(τ, a use of 'who does Bill like') and INST-ANS(ϕ, a use of 'Who hates Jill')

This is exactly as desired for conjunction.

OR For disjunction identical predictions are made *mutatis mutandis*:

(248)

Who does Bill like or who hates Jill.

$\langle$ **OR,**$\langle$ **LIKE,liker:bill,likee:**$-_{HUMAN}$ $\rangle$,
$\langle$ **HATE,hater:**$-_{HUMAN}$**,hatee:jill** $\rangle$

(249) INST-ANS(σ, a use of 'Who does Bill like or who hates Jill') if and only if σ = $\langle$ **OR,** τ, ϕ $\rangle$, where INST-ANS(τ, $\langle$ **LIKE,liker:bill, likee:**$-_{HUMAN}$ $\rangle$) and INST-ANS(ϕ, $\langle$ **HATE,hater:**$-_{HUMAN}$**, hatee:jill** $\rangle$)

In other words,

(250) INST-ANS(σ, a use of ' Who does Bill like or who hates Jill') if and only if σ = $\langle$ **OR,** τ, ϕ $\rangle$, where INST-ANS(τ, a use of 'who does Bill like') and INST-ANS(ϕ, a use of 'Who hates Jill')

The account of disjoined questions we have proposed, then, suggests that because of the exclusiveness condition associated with 'or', the felicity of such questions involves the specifying of disjuncts that are mutually exclusive. Hence, if the responder will feel (pragmatically) capable of responding, he will usually choose to utter whichever junct he knows to be true, which will convey a non-disjunctive answer. This is the reason why responses to such questions appear to be able to convey more than one true and exhaustive answer.

Conditionals

(251) a. Who will be the new Prime Minister if the little man resigns.

b. ⟨ → ⟨ RESIGN, resigner: **the little man** ⟩, ⟨ IS-A, predicated-property: PRIME-MINISTER, predicated-role:$-_{HUMAN}$ ⟩ ⟩

(252) INST-ANS(σ, a use of ' Who will be Prime minister if the little man resigns') if and only if σ = ⟨ → τ, ϕ ⟩, where INST-ANS(τ, ⟨ RESIGN, resigner: **the little man** ⟩) and INST-ANS(ϕ, ⟨ IS-A, predicated-property: PRIME-MINISTER, predicated-role:$-_{HUMAN}$ ⟩)

That is,

(253) INST-ANS(σ, a use of ' Who will be Prime minister if the little man resigns') if and only if σ = ⟨ → τ, ϕ ⟩, τ is identical to ⟨ RESIGN, resigner: **the little man** ⟩ and INST-ANS(ϕ, a use of 'Who will be the Prime Minister'.)

Notice that since ⟨ RESIGN, resigner: **the little man** ⟩ is a resolved SOA, it has only itself as a SOA that stands in the relation INST-ANS. Hence, we obtain the correct responsehood and answerhood predictions: responses to a conditional interrogative are, for the most part, identical to those elicited simply by the non-conditionalised interrogative. Nonetheless, all responses convey answers whose force is conditionalised by the (content of the) antecedent declarative.

Chapter 4

On the uses of Interrogative phrases

4.1 Introduction

4.1.1 The Issues

In chapters 1-3, we provided a characterisation of the contents of uses of interrogative sentences. We did not enter into the issue of *how* uses of interrogatives get associated with contents. In the current chapter and chapters 4 and 5, we take up this problem, the problem of assigning meanings to interrogative sentences and phrases.

In formulating our proposal in chapter 6, we will provide arguments for adopting a particular conception of meaning. Until that point, in the current chapter and chapter 5, we will be non-commital about what the *meaning* of a given expression consists in, beyond assuming that it determines when the expression can be used and what the content of that use is in line with the *question interrogative* (QI) characterisation of interrogative content provided in chapter 3. We defer discussion of the RI use of interrogatives to chapter 7.

An important issue with which we will be required to contend is: what syntactic level is a meaning assigned to? The two options we will consider are a structure corresponding closely to surface form, ('surface structure') and a structure whose

correspondence with surface form is more abstract ('logical form'). In the current chapter, in which we consider the data we take to characterise the range of meanings interrogatives manifest, our discussion will be couched in terms of surface forms, neutral between the two options. Hence, when we say 'expression X denotes Y' we mean 'on any use of surface form X, its content is semantic object Y'.

The surface form of interrogative sentences intrinsically underdetermines their meaning. This is evinced most strongly in the availability of distinct classes of felicitous responses to a given use of a single surface form. One of the main issues that will detain us is: what is the source of such ambiguities? Are they characterisable solely in terms of differing scope relations among the semantic contributions of constituents of the given form? Do they involve lexical ambiguities, characterisable at an abstract syntactic level? Are these ambiguities related to ambiguities exhibited by other, non-interrogative expressions? Are these ambiguities manifested uniformly by interrogative expressions of differing syntactic properties, and if so, how is this to be accounted for?

That the context of use serves to disambiguate certain aspects of meaning is uncontroversial. The extent to which recourse to a contextual component is required in order to account for interrogative ambiguities is, however, an open issue, which we will be required to contend with. How this is resolved depends in no small part on the assumptions of what constitutes *the* context. A working definition, which will be refined along with the general conception of meaning, is: context comprehends those aspects determining the meaning of an expression that are not represented on a linguistic (which we idealise here to be exclusively syntactic) level.

4.1.2 Structure of chapter

In the current chapter, data is provided that is intended to characterise the types of ambiguities manifested by interrogative forms. We attempt to demonstrate the existence of three classes of uses which interrogative phrases can undergo, which we dub *independent* (*roughly* 'wide scope'), *dependent*(*roughly* including 'narrow scope' and 'functional') and *reprise* (a subclass of which are 'echo' questions) uses. Our basic claim will be that for any given interrogative form, the differences between the

contents each of the uses give rise to cannot be reduced to differing scope relations bourne by (the semantic contribution of) the constituent interrogative phrase to (the semantic contributions of) other constituents of that form. Nor can these differences be reduced, we claim, to lexical ambiguities at an abstract underlying level.

Varied semantic and syntactic evidence for these claims will be supplied: in general terms, the syntactic evidence concerns the availability of each of the uses with forms where on syntactic grounds it is questionable to assume either that a scope ambiguity could arise or that a null element could occur. Sluicing and alternative questions respectively provide particularly compelling evidence to this effect. The semantic evidence includes data that suggests anaphora is uniformly availabile across scope islands with all three classes of use.

Chapter 5 is concerned with an appraisal of past work on the meaning of interrogatives, centering on the assumption shared by most previous approaches that interrogative phrases should be treated as quantificational expressions. We will argue against this assumption, showing that it requires adopting various additional assumptions that conflict with current assumptions about scope. More crucially, we show that a central motivation for the quantificational approach concerning the meaning of multiple wh-sentences is false. This is the assumption that a mixed quantifier/interrogative sentence on a reading where the quantifier is assumed to scope over the wh-phrase is synonymous to a corresponding multiple wh-sentence in which one of the wh-phrases is assumed to scope over the other.

Particularly problematic data in this regard concerns interrogative versions of Bach Peters sentences. We show that a basic asymmetry exists in the response patterns of multiple-wh Bach Peters sentences and mixed quantifier/interrogative Bach Peters sentences with crossing coreference. These asymmetries pose an intrinsic problem for any account that attempts to provide a unified treatment of interrogatives and quantifiers.

We will also consider syntactically derived arguments for the quantifierhood of wh-phrases. One important motivation in assuming wh-phrases to be syntactic quantifiers is the assumption that this can account for the data that suggests that wh-fronting in unary wh-interrogative sentences in English is a necessary condition for a use

of such sentence to make 'information queries'. In other words, it is assumed that all non-fronted unary wh-interrogative sentences can be used only to reprise, most prominently to make *echo* queries. The problematic nature of this general strategy has two sources: on the one hand, the assumption that reprise uses involve some intrinsically different *interrogative* meaning, or different interrogative expressions for that matter. Conversely, the assumption that non-fronted unary wh-interrogative sentences can only be used to make reprises. We will argue that both assumptions are false.

In chapter 6, we provide our own proposal for characterising the meaning of interrogative expressions, assumed to be represented syntactically at a surface level, combined with a storage mechanism for treating scopal ambiguities. The semantic framework we will use for meaning representation will be the situation semantics framework of Gawron and Peters 1990a, while the syntactic framework will be the HPSG framework of Pollard and Sag 1992.

The basic idea will be that interrogative phrases serve to specify focussed, unresolved argument roles. More precisely, interrogative meaning is assumed to derive from two components: the one component is a variable contributed by any interrogative phrase that acts as a place holder in an argument role associated with an interrogative phrase use, and provides additional restrictions on the argument role. The other is an indication at which sentential level the variable is input to a closure operation we will call α-closure. This is a closure operation at a sentential level, which, we will argue scopes just wider than quantificational closure. In the case of *independent* uses of interrogative phrases, the effect of α-closure is to create an unresolved SOA, whose main relation is obtained by abstracting over any variables filling argument roles associated with (independent) interrogative uses, and whose argument role(s) are unresolved. The operation defined is, thus, applicable to more than one variable simultaneously in which case a multiply unresolved SOA will result.

(254) α x $\langle$ LIKES, liker:x, likee:**jill** $\rangle$ $=_{def}$
$\langle$ λx $\langle$ LIKES, liker:x likee:**jill** $\rangle$ x:-$\rangle$ (Rough meaning for 'Who likes Jill')

(254) is a simple example. Here the SOA in which the variable x, associated

with the **liker** argument role, was previously free, is mapped by α-abstraction to the unresolved SOA, whose main relation is the property of 'being a 'liker of **jill**', and whose argument role is unresolved.

(255) α x,y ⟨ GIVE, giver:x, object-given:y, recip:**jill** ⟩ $=_{def}$
⟨ λx,y ⟨ GIVE, giver:x, object-given:y, recip:j ⟩ x:–,y:–⟩ (Rough meaning for 'Who gave what to Jill'.)

In (255) the SOA in which the variable y, associated with the **object-given** argument role and the variable x associated with the **giver** argument role, were previously free, is mapped by α-abstraction to the unresolved SOA whose main relation is the binary relation such that 'x gave y to **jill**' and whose argument roles are unresolved.

We will argue that dependent and reprise uses of *interrogative* expressions are each particular instances of use-types applicable more generally. We will show how combining the general characteristics of each use type with the characterisation of independent interrogative uses sketched above enables the defining conditions pertaining to these additional interrogative uses to be derived. This will allow for a simple and comprehensive account of the available interrogative meanings.

4.2 Independent uses of interrogative phrases

4.2.1 Introduction

In this section we provide data that characterises properties of a use we call the *independent* use of interrogative-phrases:

1. The role associated with an individually used interrogative phrase is assigned any of the available widest sentential scopes, either matrix or some embedded sentential level.

2. The scope of the role does not extend beyond its sentential scope.

3. Anaphora to an interrogative phrase across scope islands is possible.

4. Interrogative-phrases used independently that are scoped at the same sentential level do not scope each other.

4.2.2 Interrogative contents and focus

We have argued in chapter 1 that a unary wh-interrogative sentence in which the wh-phrase is fronted can be used to make a query in what is a *neutral* context for the query, that is, a context where information on whether the issue raised by the query is resolved positively or negatively.

For a unary wh-question $q(x)$, a context c_0 is *neutral* iff the context entails neither that $q(x)$ is instantiated, nor that there do not exist instantiators for $q(x)$. That is, $c_0 \not\models \exists x q(x)$ and also $c_0 \not\models \forall x \neg q(x)$.

We demonstrated in section (??) that although such queries often conversationally implicate the existence of an instantiator, the context is compatible with the lack thereof. We repeat some of the data that shows this below:

(256) a. Who likes Bill? No one.

b. Who, if anyone, likes Bill?

c. Who is in favour of amending the Bill of Rights?

Respectively, these data indicate that a response can felicitously convey a negative existential answer, that the existential suggestion is explicitly cancellable, and that for certain questions a querier can pose the query without a belief that the question is instantiated.

Asking the question has a clear effect on the context: an assertion of a declarative sentence made as a response to a query carries a different force than when uttered independently. This widely acknowledged property of responses is often expressed by saying that 'answers are foci'.

(257) a. Who does Bill like?

b. As response 'Bill likes Jill.' carries force of 'Bill likes JILL.' uttered independently.

c. As response 'Bill likes no one.' carries force of 'Bill likes NO ONE' uttered independently.

Given that *a query* can be posed in a neutral context, this means that it must be something about the descriptive content of the query that gives rise to this effect. This focussing effect of queries is the basic motivation we take for assuming that the contents of uses of such interrogatives are 'lifted' variants of the contents we argued for in chapter 1, a move the need for which we hinted in section III.1.3:

(258) a. ⟨ **LIKES, liker:bill, likee:**$-_{HUMAN}$ ⟩

b. ⟨ λ x ⟨ **LIKER, annoyed-person:bill, likee:**x_{HUMAN} ⟩ x:- ⟩

Notice though that the new and old unresolved interrogative contents are equivalent in terms of answerhood. For any SOA τ_0 that is a resolution of the lifted unresolved SOA_0, there exists a distinct SOA τ_1, that is a resolution of the unlifted unresolved SOA_1, such that τ_1 describes information necessarily compatible with that of τ_0, and *vice versa*:[1] For instance:

(259)

⟨ **LIKES, liker:bill likee: jill** ⟩

⟨ λ x ⟨ **LIKES, liker:bill likee:**x_{HUMAN} ⟩ x: **jill** ⟩

Similarly, for quantified answers:

(260) a. ⟨ NO, HUMAN λ x⟨ **LIKES, liker:bill, likee:**x_{HUMAN} ⟩ ⟩

b. ⟨ NO, HUMAN, λ y ⟨ λ x ⟨ **LIKER, annoyed-person:bill, likee:**x_{HUMAN} ⟩ y ⟩

[1]See chapter 3 for brief discussion of the notion of informational compatability assumed here, and how this is captured formally.

We believe that this fact, that argument roles associated with individual uses of interrogative phrases are focussed and hence take a widest sentential scope, is one of the key facts about interrogative phrase meaning in general, and which, suitably modified, holds for all classes of interrogative phrase use. As we shall see, there are various cases where the argument *role* associated with the interrogative-phrase clearly does not take widest scope. We will argue, however, that this has two general causes: one is the effect of *embedding* an interrogative content as an argument of a predicate, in which case the role associated with the interrogative phrase gets widest *embedded* scope. Scoping effects that arise from 'echo' uses of interrogatives are also subsumed under this account, as will become clear in section (4.4). The other cause arises when the interrogative phrase is used to specify a functional dependency between argument roles, a type of use first recognized by Engdahl, and which we initially discuss in section (4.3). In such a case, it is the specification for the dependency that is focussed and receives widest sentential scope.

Let us, then, see further evidence for the need for the 'lifted', focussed property and the scopal flexibility it allows for the interrogated role.

4.2.3 Anaphora

First, a pragmatic caveat: given the fact that wh-queries can be posed in neutral contexts, this means that there is frequently a background of epistemic uncertainty with respect to the filler of the unresolved role. As has been argued above, there is not even an existential *presupposition* associated with this role. Thus, anaphora to such uses of wh-phrases faces pragmatic resistance. This applies especially if it is the querier who is using the anaphora, and most particularly when the anaphora is a constituent of an *asserted* proposition. Adding information about an entity whose existence is not (conventionally) established by the speech act, even by as minimal a move as results from picking a gender for the pronoun, requires a certain degree of accommodation, in the sense of Lewis 1979. It should be clear that finding examples of *infelicitous* anaphora to wh-phrases, especially with monologue, should not present particular difficulties:

(261) *Who* do you like? # *He* is very tall.

Controlling for these factors does help. For instance, if there are plausible grounds for the utterance of which the anaphora is a constituent, or if the utterance is an additional query, which maintains, so to speak, the low epistemic level:

(262) a. I'm curious. *Who* came to the party? One thing's for sure. *They* left a BIG mess.

b. Major is going to check *who* is in charge and how *they* plan to restructure the economy. (The Independent, August 25 1991)

c. *When* is the next neurolinguistics professor going to be appointed? I sure hope *it* will be before the turn of the century.

d. *Which Stanford student* was late? Was *she* also rude?

e. *Where* were you born? Does your family still live *there*? (From a questionnaire cited in a Stanford departmental colloquium given by D. Schiffrin, 1990.)

All these examples illustrate quite definitively, it would seem, that in English anaphora to wh-phrases across 'scope islands' is possible. Nonetheless, the readings such anaphors manifest suggests that the scope of the role associated with the interrogative phrase does *not extend* intersententially.

Consider (263):

(263) a. I'm curious. *Who* came to the party? One thing's for sure. *They* left a BIG mess.

b. The people who came to the party, whoever they may be, left a big mess.

c. Who came to the party, (assuming) they left a big mess?

The reading the assertion in (263a) appears to get is the one in (263b), rather than the one in (263c). This latter content is the reading that would arise were we to

assume that the role associated with the interrogative phrase scopes intersententially: if we use bound variable anaphora, and wh-expressions are scopeless, then the the content of the discourse will no longer contain a query followed by an assertion, rather it will become one compound unresolved SOA with a reading as in (263b). Schematically:

(264) $\wedge$, ⟨ **CAME-TO-THE-PARTY**, comer:x ⟩,
⟨ MADE-A-BIG-MESS, messer:x ⟩

Similar remarks apply to the other examples, for instance (265):

(265) a. *Where* were you born? Does your family still live *there*?

b. Does your family still live in the place where you were born, whatever it might be?

c. Where were you born, (assuming) your family still lives there.

Allowing the role associated with the interrogative phrase to extend intersententially, using bound-variable anaphora, forces a yes/no question to be scoped by a wh-phrase, which results typically in malformed contents, and, regardless, seems to yield an undesired content, paraphrased as in (265c). Rather, the desired content is as in (265b): one is interested to find out the identity of the place the addressee was born at, and inquiring of it, the place where he was born whatever it is, whether his family still resides there.

Data resembling these motivated Evans to introduce the notion of E-type anaphora. The anaphora in (266a) is typically resolved as in (266b) rather than (266c), the resolution that would arise were the scope of the role associated with the quantifier phrase 'some sheep' allowed to extend intersententially:

(266) a. Bill owns *some sheep*. He vaccinates them in the spring.

b. Bill vaccinates the sheep he owns in the spring.

c. Bill owns some sheep that he vaccinates in the spring.

Similarly with examples like:

(267) a. Jill owns *exactly one car. It* is blue.

b. The car Jill owns is blue.

c. Jill owns exactly one car that is blue.

Notice, then, that the focussed interrogative sentence contents we posited above can be used to provide a straightforward E-type anaphoric account of these facts. Assuming for expository simplicity that E-type anaphora involves a quantification with quantificational force of a definite determiner, the 'queried property' provides directly for the restrictive term:

(268) a. *Who* came to the party?

b. ⟨ λ x ⟨ **CAME, comer:x**$_{HUMAN}$**, location: the party** ⟩ x:− ⟩

c. One thing's for sure. *They*, the people who came to the party, whoever they are, left a BIG mess.

d. ⟨ THE, λx ⟨ **CAME, comer:x**$_{HUMAN}$**, location: the party** ⟩,
λz⟨ LEFT-A-BIG-MESS, leaver: z ⟩ ⟩

Similarly, with (265), whose yes/no component we ignore here for simplicity:

(269) a. *Where* were you born?

b. ⟨ λx ⟨ BORN, born-person: ADDRESSEE, location:x ⟩ x:− ⟩

c. Your family still lives *there*, the place where you were born, whatever it might be?

d. ⟨ THE, λx ⟨ BORN, born-person: ADDRESSEE, location:x ⟩,
λz ⟨ STILL-LIVE-THERE, liv-er:ADDRESSEE's family, location: z ⟩ ⟩

That this anaphora is *grammatically* resolved, e.g. through a process like E-type anaphora, rather than simply deictic accommodation is suggested by data from languages where deictic/grammatical anaphora is more finely distinguished. Comorowski 1989, for instance, provides data from Romanian on this score. In general, overt pronouns allow only for deictic readings, though null pronouns allow for bound variable readings:

(270) *Nici un student* nu îsi închipuie că * *el* [must be deictic]/*pro* e destept.

Not one student not imagines that he is intelligent.

No student thinks that he is intelligent.

According to Comorowski, anaphora to an interrogative phrase is possible, though only with a null pronoun:[2]

(271) a. *Cine/Care dintre acesti bârbati* te-a atacat.

Who/ Which of these men you has attacked?

b. (Nu stiu, dar) *pro*/**el* avea ochi verzi si o cicatrice pe obrazul sting.

not-I know but he had eyes green and a scar on cheek-the left.

4.2.4 Independent uses and embedding

Basics

Interrogative contents can be embedded as arguments of sentential complement predicates, as we saw in some detail in chapter 1. In fact, an argument role associated with an interrogative phrase can, subject in certain languages to syntactic constraints, be scoped with widest sentential scope, and be an unresolved role available for querying, or be scoped to be an unresolved role of an embedded unresolved content. This suggests, then, that our interpretation method must be flexible enough to provide

[2]Comorowski herself concludes that the anaphora in question involves binding a variable intersententially. This is because she appears to assume that deictic and bound variable anaphora exhaust the possible anaphoric mechanisms.

scoping of roles associated with interrogative phrases at any of the possible sentential levels. This possibility was first pointed out by C.L. Baker, with respect to a sentence such as

(272) Who asked what Jill bought where?

(272) has (at least) two types of readings. The first reading elicits a response such as

(273) John did.

The other reading elicits a response such as

(274) John asked what Jill bought at Peete's, while Jim asked what she bought at the Proluv.

This suggests the following analysis: in the first case, both argument roles associated with interrogative phrases in the embedded content are assigned scope at the embedded level. There is solely one argument role that is an unresolved role of the entire content, namely the *asker* role. In the second case, in addition to the *asker*, the *location* argument role is also an unresolved role of the entire content, scoped at the matrix sentential level.[3]

The focussed interrogative contents we proposed can capture these two readings: we have not, as yet seen evidence to distinguish the possibilities that the two roles scoped at the matrix level strictly scope each other or not. We will soon see evidence suggesting that in multiple wh-questions have uses in which the interrogated argument roles *do not* strictly scope each other. For those uses, then, the two contents for the Baker sentences would be these:

(275) a. Who asked what Jill bought where?

b. Elicits response 'John does':

⟨ λx ⟨ **ASK, asker:x,** ⟨ λz,y ⟨ **BOUGHT, buy-er:jill, object-bought:z,location:y** ⟩ z:–,y:– ⟩ x:– ⟩

[3]In fact, in certain cases, it is plausible to assume that the *in situ* embedded wh-phrase is used *dependently*, in the sense discussed in section (4.3), but that does not affect the argument.

c. Elicits response 'John asked what Jill bought at Peete's, while Jim asked what she bought at the Proluv.':

⟨ λx,y ⟨ **ASK, asker:x**, ⟨ λz ⟨ **BOUGHT, buy-er:jill, object-bought:z,location:y** ⟩ z:– ⟩ x:–,y:– ⟩

Assuming the need for scoping among the roles associated with the matrix sentential content, this could be done by additional abstraction. We will shortly see evidence against the need for this.

Evidence for ambiguity

Hirschbühler 1981 makes a persuasive case that the different types of responses to the Baker sentences arise from an ambiguity. His method is to show that in certain cases only one type of response pattern is possible, deducing this by showing that the reading giving rise to the other response type is ruled out by a Sag/Williams condition concerning ellipsis. This is a condition prohibiting bound and free occurrences of the same variable in a source and target of ellipsis. Schematically, we describe this as follows:

(276) a. Who knows where we bought which book and who already did yesterday.

b. ⟨ ∧, ⟨ λx ⟨ KNOW, knower:x, ⟨ λy,z ⟨ BOUGHT, object-bought: y, location: z ⟩ y:–,z:– ⟩ x:– ⟩, ⟨ λt ⟨ KNOW-YESTERDAY, t, ⟨ λ y,z ⟨ BOUGHT, object-bought:y, location: z ⟩ y:–, z:– ⟩ t:– ⟩ ⟩

c. ⟨ ∧, ⟨ λx,z ⟨ KNOW, knower:x, ⟨ λy ⟨ BOUGHT, object-bought: y, location: z ⟩ y:– ⟩ x:–,z:– ⟩, ⟨ λ t ⟨ KNOW-YESTERDAY, t, ⟨ λy ⟨ BOUGHT, object-bought:y, location: z ⟩ y:– ⟩ t:– ⟩ ⟩

(276a) only seems to elicit responses of the type described by the reading schematically depicted in (276b). Hirschbuhler points out that the alternative reading. as

depicted in (276c) stands as a violation of the Sag/Williams condition, since z is unbound in the second conjunct.

Hirschbühler also points out that, conversely, if the Baker sentence only had the reading where both wh-phrases provided roles unresolved at the embedded level, one could not account for the felicity of the following:

(277) Who knows which boy subscribed to which magazine and which girl did too.

Syntactic constraints

Baker noted that sentences like the following do not allow for a further two conceivable readings:

(278) a. Who knows what Jill bought where?

b. # John knows where Jill bought espresso grind, while Jim knows where she bought a cake.

c. # John knows that Jill bought espresso grind at Peet's, while Jim knows that she bought a cake at the Proluv.

Languages without wh-fronting such as Turkish and Japanese apparently do give rise to response patterns as in (278b) (cf. Hankamer 1974). We do not offer for the moment an account of this restriction. We note also that cases as in (278c) can arise when the embedding predicate is not applicable to interrogative contents:

(279) a. Which mathematician thought which problem had which solution?

b. Gauss thought the Fundamental theorem had an algebraic solution, Fermat thought his problem had a simple solution, etc.

We return to a more detailed discussion of these syntactic constraints in section (6.3) of chapter 6.

4.2.5 Uniqueness relativisation and Bach—Peters sentences

Evidence supporting the existence of multiple-wh-contents in which roles associated with interrogative phrases do not strictly scope each other is provided by interrogative Bach-Peters sentences. The data suggests that interrogatives have scopal properties that are markedly distinct from those of nominal quantifiers.

Uniqueness and 'which phrases'

'which phrases' where the common noun phrase is singular carry a uniqueness presupposition that 'who' does not carry:

(280) a. Can you remind me please which Canadian athlete was suspended in 1988?

b. Ben Johnson.

c. Let's see, # Ben Johnson, Trevor Smith,...

(281) a. Can you remind me please who was suspended in 1988?

b. Let's see, Ben Johnson, Trevor Smith,...

No existential presupposition is involved:

(282) a. Which senator, if any, is competent to run for president?

b. Which president, if any, would sacrifice his career for the sake of a career in marketing?

c. I'm quite uncoordinated. Which sport, if any, do you think I could excel in?

The obligation placed on the speaker is roughly this: even if she does not *know* that an entity satisfying the *queried* property exists, she must be in possession of knowledge that an entity satisfying the *restrictive* condition exists, and she *strongly suspects* that it, whatever or whoever it is, does satisfy the *queried* property. Hence, a query that uses such a question as its descriptive content must start from a considerably higher informational level than a corresponding question with 'who' or 'what'.

However, in certain multiple 'which- sentences', as noted by Higginbotham and May 1981, the uniqueness can disappear, as long as the specification providing the answer is, roughly, 1-1: thus (283b) is a possible response to (283a).

(283) a. Which Canadian athlete won which competition in 1988 ?

b. Ben Johnson won the 100 meters, Debbie Brill won the high jump,...

This is something of a puzzle if we think of 'which phrases' simply as interrogative quantifiers carrying a uniqueness presupposition, since definite noun phrases used quantificationally with widest sentential scope carry a uniqueness presupposition, or some slightly weaker condition, but this is maintained in multiple quantificational contexts:

(284) The woman with the big hat saw the girl with the polka dot dress.

Bach Peters sentences

The interesting point is that uniqueness does not disappear in all multiple wh-sentences. Consider the following Bach Peters sentence and a plausible rough content for it on a crossing coreference reading:

(285) a. Which pilot who shot at it hit which Mig that chased him?

b. ⟨ λ x,y ⟨ HIT, hitter: x, pilot x who shot at y, hittee: y, Mig y that chased x ⟩ x:−,y:− ⟩

'Crossing coreference' readings *are* available but do not elicit pair-list responses:

(286) a. Which pilot who shot at it escaped which highly touted Mig that chased him?

b. G.H Bush was the pilot, D224 of squadron u3 was the Mig.

c. # Bush was the one who shot at and escaped Mig 345, Harkin was the one who shot at and escaped Mig 435,...

(287) a. Which director who produced it backed out of which highly publicised movie that was causing him losses?

b. Coppola was the director, the movie was Hammett.

c. # Coppola was the director who backed out of Hammett, Ponti was the director who backed out of the bicycle thief,...

Note that the possibility of a pair-list response is *not* improved substantially if the second pronominal dependency is removed:

(288) a. Which pilot who shot at it escaped which highly touted Mig?

b. G.H Bush was the pilot, D224 of squadron u3 was the Mig.

c. # Bush was the one who shot at and escaped Mig 345, Harkin was the one who shot at and escaped Mig 435,...

(289) a. Which director who produced it backed out of which highly publicised movie?

b. Coppola was the director, the movie was Hammett.

c. # Coppola was the director who backed out of Hammett, Ponti was the director who backed out of the bicycle thief,...

Quantifier/interrogative Bach-Peters sentences show markedly different behaviour: a crossed reading should correlate with a use where a dependency is established between the argument role associated with the interrogative and the argument role associated with the quantifier. In fact, the only available reading seems to be one where the interrogative role is *independent* of the quantifier role, that is, the interrogated argument role has widest scope. The pronoun in the restriction on the interrogative has to be interpreted deictically if the pronoun in the restriction on the quantifier is bound by the interrogative:

(290) a. Which pilot who shot at it escaped each highly touted Mig that chased him?

b. # G.H Bush was the pilot, D224 of squadron u3 was the Mig.

c. # Bush was the one who escaped Mig 345, Harkin was the one who escaped Mig 435,...

d. G.H Bush was the pilot who evaded all the Migs

(291) a. Which highly touted Mig that chased him did every pilot who shot at it escape?

b. # G.H Bush was the pilot, D224 of squadron u3 was the Mig.

c. # Bush was the one who escaped Mig 345, Harkin was the one who escaped Mig 435,...

d. D224 of squadron u3 was the Mig.

(292) a. Which director who produced it backed out of each highly publicized movie that was causing him losses?

b. Coppola.

c. # Coppola was the director who backed out of Hammett, Ponti was the director who backed out of The Bicycle Thief,...

On the other hand, if the second pronominal dependency is removed, a pair-list response becomes available:

(293) Which pilot who shot at it escaped each highly touted Mig?

G.H Bush was the pilot who hit Mig224 of squadron u3.

Bush was the one who shot at and escaped from Mig 345, Harkin was the one who shot at and escaped Mig 435,...

G.H Bush was the pilot who evaded all the Migs.

(294) a. Which director who produced it backed out of each highly publicized movie?

b. Coppola.

c. Coppola was the director who backed out of Hammett, Ponti was the director who backed out of The Bicycle Thief,...

(295) a. Which highly touted Mig that chased him did every pilot escape?

b. # G.H Bush was the pilot, D224 of squadron u3 was the Mig.

c. Bush escaped Mig 345, Harkin escaped Mig 435,...

d. The Mig was D224 of squadron u3 .

What this data indicates appears to be the existence of distinct response eliciting behaviour between multiple wh-sentences and corresponding quantified interrogative sentences: the former allow for crossing co-reference, the latter do not.

These data are problematic for approaches that assume interrogatives to denote quantificational elements since if the crossing co-reference is bound variable anaphora, it requires scoping at an identical level. However, even if that problem is eliminated by using some different anaphoric or scoping mechanism, the problematic aspect raised here is the asymmetry in behaviour between interrogative phrases and nominal quantifiers.

4.2.6 Evidence from Adverbs

The following data, based on examples due to Berman 1990, illustrates that whereas indefinite descriptions can interact scopally with adverbs of quantification, wh-phrases do not.

(296) a. Which regular customer rarely tips big?

b. A regular customer rarely tips big.

(297) a. For the most part, which regular customer tips big?

b. For the most part, a regular customer tips big.

The interrogative sentence in (296a) manifests only a reading in which the adverb 'rarely' becomes part of the descriptive condition for the interrogated role. This is depicted schematically as follows:

(298) ⟨ λ x ⟨ RARE, ⟨ TIPS-BIG, tipper:x, x regular customer ⟩ ⟩ x:– ⟩

On the other hand, (296b) while perhaps weakly manifesting a 'specific indefinite' reading, is most prominently construable as quantifying over (habits of) regular customers:[4]

(299) a. For any regular customer x, it is rare that x tips big.

b. ⟨ RARE, REGULAR-CUSTOMER, λ x ⟨ TIPS-BIG, tipper:x, x regular customer ⟩ ⟩

Similar remarks apply to the examples in (297).

4.2.7 Sluicing.

Introduction

In this section we consider the phenomenon of sluicing first discussed by Ross 1969. Ross originally claimed sluicing as an argument for an intrinsically *syntactic* deletion process. Since then various proposals have been provided, all aimed at providing an appropriate sentential antecedent: accounts have varied on whether the missing S (henceforth 'missing predicator') is deleted (Ross), reconstructed (Levin 1982), or is an empty category co-indexed with an antecedent (Lobeck 1986). The general assumption they share is that sluicing involves interpreting a bare wh-phrase as *if a copy of an antecedent S is present* (The 'S' ellipsis' assumption):

(300) I know someone came into the office yesterday, but I don't know who. (= but I don't know who came into the office yesterday.)

[4]We do not enter into issues of the 'proportion problem'. For simplicity, we assume that the quantification is over individuals, though more careful analysis might profitably analyse the quantification over events of some kind.

We first demonstrate that the *S ellipsis hypothesis* is false on semantic grounds. The interest this construction holds for us centers on two issues: on the one hand, we will use it as a probe that will show the independence of the three uses we posit for wh-phrases, namely independent, reprise and dependent. On the other hand, we will invoke sluiced forms as a class of forms that in *biassed* contexts is, typically, preferred to non-elliptical wh-sentences where the wh-phrase is *in situ*.

The falsity of the S ellipsis assumption

First, according to the S' ellipsis assumption, the sluice in (301a) should be paraphrased as in (301b):

(301) a. John likes some students, but I don't know who.

b. I don't know who John likes.

In fact, the sluiced conjunct of (301a) should be paraphrased, roughly as:

(302) I don't know who the students John likes are.

The contrast between these two paraphrases is brought out sharply in (303):

(303) a. I know that no miners revolted, #but I don't know who.

b. I don't know who revolted.

c. I don't know who the miners who revolted are.

d. I know that no miners revolted, but I don't know who did revolt.

The sluice in (303a) is infelicitous. Given the paraphrase in (303c) we have an immediate explanation: the first conjunct in (303a) asserts that the set of miners who revolted is empty. The sluiced embedded question, in contrast, expresses, according to (303c), ignorance about this extension. Hence the infelicity. On the other hand, given that (303d) *is* felicitous, the paraphrase (303b), based on the S' ellipsis assumption, cannot account for the infelicity of (303a). Thus, the facts in (303) refute the S' ellipsis

assumption and destroy much of the motivation for either a deletion or reconstructive analysis.

Second, consider sluicing with wh-question antecedents:

(304) a. Which person will win the next election and by what margin?

b. Which person will win the next election and by what amount will which person win the next election?

c. Which person will win the next election and by what amount will s/he, the winner of the next election, whoever s/he is, win?

In this case, syntactic deletion or copying of the first conjunct results in a multiple wh-question that subsumes the first, thus making it redundant, as in (304b). However, in order to get the right interpretation, the 'missing predicator' must include anaphora to the interrogative phrase in the first conjunct. This is illustrated in (304c). The anaphoric interpretation required is precisely the E-type content we argued for in section (4.2.3) above.

Third, despite claims to the contrary (Hankamer and Sag 1976), it seems clear that the missing predicator *can* be resolved entirely independently of a linguistic antecedent:

(305) a. Coffee sounds good. When ? (gloss: 'When shall we have coffee ?')

b. [Dog owner holding leash to enthusiastic dog:] Where to, Spot ? (gloss: 'Where do you want to go to' or 'Where shall we go to ?' etc.)

c. [Impassioned activist pointing at the charred ashes of his house, burnt down by an angry mob:] I ask you for heaven's sake: *why*?

Resolving sluices

The data above is suggestive of a view that sluicing involves the resolution of the missing predicator using a property salient in the context. Evidence strengthening this view will be provided in coming sections where we see that the sluice elements

can be used to elicit pair-list responses and to make reprise or echo queries. Consider one example of a sluice resolution:

(306) a. Someone came into the office. Who?

b. ⟨ SOME, PERSON, λ x⟨ CAME-INTO-THE-OFFICE, comer: x ⟩

c. Who (is he, the person that came into the office today)?

Not surprisingly, we suggest that the mechanism here makes use of E-type interpretation, which we already discussed in section (4.2.3) above. The predicate 'is he' is resolved by using the content E-type anaphora makes available:

(307) ⟨ λ z ⟨ BE, predicated property:λ x⟨ CAME-INTO-THE-OFFICE, comer: x, person x ⟩ predicated-role:z ⟩ z:– ⟩

Ross noted facts that he claimed were problematic for any semantic (in his terms 'interpretive') view of sluicing, most dramatically that in a case sensitive language like German, sluices must concord in case with their 'antecedents'. Without providing an account of these facts, we would claim that they do not conclusively establish the syntactic nature of the process, though they indicate that sluicing is a construction subject to grammatical constraints. An intrinsically syntactic account of sluicing is highly problematic, given the facts we have seen above. In fact, given the availability of contextual resolution of sluicing, it is not surprising that picking a resolution deriving from a property made salient by a use of an *overt* linguistic expression requires some parallelism. Such parallelism is involved in various other elliptical processes. Queries, for instance, can be responded to with elliptical, bare constituents ('short answer')that are interpreted as assertions. These forms are required to concord with the case imposed on the expression associated with the interrogated role:

(308) To whom did John give the book? To Jill/ # Jill.

For short answers, the 'missing predicator' is resolved to the queried property:

(309) a. ⟨ λ x ⟨ GAVE, giver: john, object-given: the book, recipient:x ⟩ x:– ⟩

b. To Jill, John gave the book.

c. ⟨ λx ⟨ GAVE, giver: john, object-given: the book, recipient:x ⟩, x: jill ⟩

4.2.8 Alternative phrases

We suggested in section (1.5.4) that constituent alternative sentences had contents of the following schematic nature:

(310) a. Did [Johnson or Kennedy] escalate the Vietnam war?

b. ⟨ ESCALATED-THE-WAR, escalator:$-_{johnson \vee kennedy}$ ⟩

We mark the alternative constituent as [X1 or X2] to dismabiguate what in English is done via intonation. We propose that alternative phrases have *contents*, though not syntactic properties very much like 'which phrases' in which the descriptive property is 'is identical to disjunct1 or disjunct2'. This provides a ready account for the similarity in response, noted by Bauerle 1979, between queries using the following sentences:

(311) a. OK, so which person would you accuse of escalating the Vietnam war, Kennedy or Johnson?

b. Which of Kennedy or Johnson would you accuse of escalating the Vietnam war?

c. Would you accuse [Kennedy or Johnson] of escalating the Vietnam war?

In the following sections we shall see that alternative phrases share all the uses wh-phrases manifest. We note for the present some of the commonalities apparent given the properties discussed above:

- Focus property of response:

(312) Did [John or Bill] leave? 'John left' uttered as response carries force (no weaker than) 'JOHN left.' uttered independently.

- Adverbial effect:

  (313) Does [John or Bill] regularly/seldom tip big?

  Adverb does not take scope over alternative phrase.

- Sluicing:

  (314) Do you like [John or Bill] and why (= Why is it that you like that person, whichever of John or Bill it happens to be.)

  (315) Someone came into the office today. Yeah? [John or Bill]? (= Whichever of John or Bill was the person who came into the office today?)

4.3 Dependent uses

4.3.1 Introduction

Pronouns, according to a view inspired by Quine, are like variables. They are either free, in which case their value must be fixed by the context, or they get *bound*. Wh-phrases, on the conception advocated sofar, can be used *independently*, in which case they parametrise or leave as unfilled an argument role. Does there exist an analogous conception of a *bound* use of wh-phrases? We will argue that indeed such a use does arise, its existence most clearly evinced in quantifier/wh interactions such as readings which elicit responses of the following kind:

(316) a. What piece does every cellist like most?

b. The piece she played in her first encore.

c. Jacqueline du Pre liked the Elgar, Harel the Mendelsohn sonata,...

Our intent, then, is to establish two main points. On the one hand that the grammatical mechanism underlying interrogative meanings that give rise to readings as in (316) is one instance of a family of uses, another instance of which is bound variable anaphora.

On the other hand, we seek to establish clearly that *all* such readings derive from this source. In particular, we argue against the assumption that a mechanism for creating 'family of questions' obtained by scoping a quantifier wider than an interrogative content is ever the source of such readings. In addition, we emphasise the similarities between interrogative meanings that give rise to pair-list and functional responses and those that give rise to the independent use discussed in the previous section. This includes the availability of anaphora across scope-islands, the resolution of sluices to yield pair-list and functional responses, and the availability of the dependent use with alternative phrases.

4.3.2 Dependencies between argument roles

Various researchers including Geach 1962, Evans 1980, Gawron and Peters 1990a, have argued that a single mechanism is responsible for the anaphora in both (317a) and (317b):

(317) a. Every Brit is quite attached to her blue teapot.

b. Ming is quite attached to her blue teapot.

Although a wide range of proposals exist, differing in crucial and not so crucial details, on the nature of this mechanism, it seems quite uncontroversial to say that there is a basic commonality to these proposals, namely that a *dependence* is imposed by one semantic argument role on another, which latter lies in the scope of the former. The dependence is none other than *equality*. The composite relation that emerges can then either be used to predicate of a referential noun phrase (317b) or be quantified over (317a).

Partee 1989 describes various types of dependence introduced by a wide range of grammatical elements that also have a deictic use (tense, adjectives, nouns etc.) A small sample of the examples she provides are given in (318):

(318) a. Every sports fan in the country was at a local bar watching the play-offs (due to J. Mitchell)

b. Every participant had to confront and defeat an enemy. (Partee 1989)

c. Most travelers who stop for the night believes there's a better place to stay five miles further away. (Partee 1989)

The picture that emerges from this set of data is that certain grammatical elements can be used in two ways, either deictically, in which case the descriptive condition $D(x, y)$ they carry is used to pick out an entity satisfying the description, by fixing the independent variable deictically: in (318a) 'a local bar' used deictically helps pick out a bar, *local* to some specific environ, in (318b) 'an enemy' used deictically picks out a certain person *hostile* to a group of people etc. The other use, we shall call *dependent*, utilises the descriptive condition to establish a relational association between argument roles. In this case, 'a local bar' is used to derive a complex relation such that one argument role is dependent on the other via the 'local bar' function.

4.3.3 Functional uses of NP's

Gawron and Peters 1990b have proposed that in sentences such as (319) the NP's filling the subject argument provides an indefinite description for a function, rather than being bound by the quantifier:

(319) a. Devotion to his country characterizes every trade-unionist. (After P. Sells)

b. Its title is the most memorable thing about every OW play and it is the most memorable thing about every GBS play too.

c. If its title were the most memorable thing about every OW play, I would admit that it is.

The problem such sentences pose is that if indeed the subject NP's were bound by the appropriate quantifiers, they would pose counterexamples to syntactic characterisations of scope in English (c-command, or 'refined' linear precedence, see below). (319c) also poses a problem for the familiar Sag/Williams generalisation about ellipsis, namely that an elided VP has to fall within the scope of a quantifier that scopes over the source VP of the ellipsis.

Gawron and Peters suggest that the NP's in question denote functional entities: so that in (319b), for instance, 'its title' denotes a function which takes an entity to its title, whereas the VP is a property of functions, in this case the property of being a function that takes each Oscar Wilde play to the best thing about that play. Schematically:

(320) a. Its title is the most memorable thing about every OW play.

b. $\langle$ λ h[EVERY,OW-play(x), λ x(Most-Memorable,h(x),x)], $g_{\forall x(Title(x)=g(x))}$ $\rangle$

That such readings can arise with quantifier-less antecedents is indicated by examples such as the following:

(321) Breaking their left leg was the worst thing that happened to Gullit and Van Basten, but that specific (type of) injury certainly has furthered many (other) centre forwards' careers.

A similar account, in principle though not detail, is offered by Jacobson 1991 to account for the possibility of a non-referential reading of the definite 'his mother' present in a sentence of a type discussed by Geach 1962 and by Hornstein 1984:

(322) His mother is the woman who every Englishman loves.

Following the account of Gawron and Peters, the content posited here would be:

(323) $\langle$ λh[EVERY,Englishman(x), λ x(LOVES,y=h(x): woman y,x)], $g_{\forall x(MOTHER(x)=g(x))}$ $\rangle$

4.3.4 Interrogatory dependencies and functional answers

We have suggested that certain expressions, that are not necessarily pronominal syntactically, can be used to establish functional dependencies between argument roles. In addition, there appear to be grounds to recognize a use for NP's in which they

denote functions. The intuitive idea behind the notion of a *dependent* use of a wh-phrase, or other interrogative phrases, builds on these two independent observations: the idea is that in such cases the use of the interrogative sentences provides a SOA with an unfilled role for a dependence between argument roles. Responses to queries using such questions provide expressions denoting such functions. Such expressions can be provided in different forms, one of which involves a functional use of an NP, the other an explicit pair by pair enumeration of the graph of the function. In the former case, the answer can also be conveyed by means of a use of a sentence of the form provided in (319) where the subject is used functionally.

The most basic motivation for the recognition of dependent uses, due to Engdahl 1980, is the following. Consider (324):

(324) a. (Even if you've never met many,) Which person do you believe each graduate student depends on the most?

b. (Even if you've never met many,) Which person do you believe most graduate students depends on the most?

c. (Even if you don't know them personally) Which person do you believe Tom, Dick and Jerry depend on the most?

Such questions can be used to specify an entity quite independently of the filler of the (embedded) subject argument. That is, what we have here is not a multitude of questions, one for each graduate student, or for each of Tom, Dick and Jerry, but rather *one* question providing an unresolved role for a dependence between the subject and the object arguments. The reason for thinking this is that queries using such questions can be truthfully *answered* in the absence of specific knowledge about the individual instantiators of the antecedent argument role, in this case, the subject argument.

The same response (modulo agreement, which seems tangential to the issue) is applicable to an interrogatory use of the sentence, where a *different* advisor is supposed to exist for each (or most) graduate student(s) or member of the group consisting of Tom, Dick and Jerry:

(325) a. Her advisor.

b. Their advisor.

The content associated with independent uses of interrogatives in section (4.2) cannot accommodate answers where the advisor varies with each filler of the subject argument, since the *argument role* associated with the wh-phrase has widest scope in such cases:

(326) ⟨ λx ⟨ BELIEVE, believer: ADDRESSEE, ⟨ EVERY, GRADUATE-STUDENT, λy ⟨ RELIES-ON relier:y, relied-on:x ⟩ ⟩ ⟩ x:– ⟩

The same arguments regarding scope which motivated Gawron and Peters 1990 and Jacobson 1991 to assume that NP's have a use in which they denote functions can be brought to bear as with regards to the NP's in (325).[5]

A corresponding Geach sentence can be used to convey a functional answer of a force equivalent to that of the elliptical response 'her/their advisor':[6]

(327) a. Their advisor is the person most graduate students/Tom. Dick and Jerry depend on the most.

b. Her advisor is the person each graduate student depends on most.

This suggests, then, that the answers conveyed by the elliptical responses are schematically:

(328) a. ⟨ λh[λx ⟨ RELIES-ON relier:x relied-on:y,y = h(x) ⟩ x: **tom,bill and harry** ⟩], h: $g_{\forall x(ADVISER(x)=g(x))}$ ⟩

b. ⟨ λh[EVERY, GRADUATE-STUDENT(z),λz ⟨ λx ⟨ RELIES-ON relier:x relied-on:y,y = h(x) ⟩ x:z ⟩], h: $g_{\forall x(ADVISER(x)=g(x))}$ ⟩

[5]This was noted, independently, in Jacobson 1991.

[6]In fact, the force of the Geach sentence is somewhat stronger than that of the elliptical response, since it carries with it a uniqueness presupposition that the elliptical response only implicates. The defect in the contents provided here lies not in the contents provided for the functional answers, but rather in the contents for the Geach sentences that do not, as they stand, capture this presupposition

From this one can conclude that the contents of the interrogative uses are:

(329) a. ⟨ λ h[λx ⟨ RELIES-ON relier:x relied-on:y,y = h(x) ⟩ x: **tom,bill and harry**)], h:– ⟩

b. ⟨ λ h[EVERY, GRADUATE-STUDENT(z),λz ⟨ λx ⟨ RELIES-ON relier:x relied-on:y,y = h(x) ⟩ x:z)], h:– ⟩

Notice that the contents posited here for the dependent use, just as in the independent use, have the unresolved role, in this use a role for a dependency, as bearing widest scope.

We would like to stress two points: first, a use such as we have seen above cannot be accommodated simply by quantifying into an interrogative content an insight due to Engdahl 1980, discussed in detail in Engdahl 1986 and also in Groenendijk and Stokhof 1984. The fundamental reason for this has been mentioned above: answerability independently of knowledge concerning the filler of the 'antecedent role', as in a putative content for a family of questions:

(330) ⟨ EVERY, GRADUATE-STUDENT(z),λz ⟨ λ y ⟨ λx ⟨ RELIES-ON relier:x relied-on:y ⟩ x:z ⟩ y:–⟩ ⟩

Moreover, the existence of functional responses regardless of the scopal nature of the antecedent, in particular with referential antecedents, is problematic to account for if this reading is seen as a scope ambiguity. In particular, it requires assuming that plurals are quantificational in nature, a position rejected by much current research (see e.g. Link 1983, Roberts 1987, Landman 1989).

This latter argument applies equally as evidence against associating pair-list responses such as (331), for which Engdahl's cognitive argument cannot be used, with a family of questions reading:

(331) Well, Bill depends the most on his cousin, Mike depends the most on Minnie. Jerry depends the most on Jing, ...

An issue that will detain us below and in section 1 of chapter 5 is whether an ambiguity in the question should be posited to account for the pair-list/functional differences in the format of the response. We argue against the need for this.

4.3.5 Sluicing and dependent uses

The sluice in (332a) can give rise to response patterns as in (332b,c):

(332) a. Every cellist has a favourite piece.

Oh yeah, what/which one?

b. The piece she played in her first audition.

c. Jacqueline du Pre liked the Elgar, Ofra Harnoy the Dvorak,...

The force of uttering (332b) seems equivalent to one arising through a *functional* use of the subject in

(333) The piece she played in her first audition is every cellist's favourite piece.

In other words, the sluice seems resolved to be

(334) What is (the thing that is) every cellist's favourite piece?

In section (4.2.7) we demonstrated that various ways in which sluices are resolved could not be a consequence of a syntactic deletion or reconstruction process. Similar remarks apply here: a (plausible) resolution of the sluice in (332) above which gives rise to the functional and pair-list response patterns does not correspond to any (surface) syntactic constituent.

If, on the other hand, we assume that pair-list and functional responses arise because interrogative phrases can be used to specify functional dependencies, then, in principle, there exists a direct way of generating a resolution for the sluice using a content similar to a 'Geach sentence'. Schematically,

(335) The piece that is every cellist's favourite is the one she played in her first audition.

(336) ⟨ λh[EVERY,Cellist(x), λ x(BE-FAVOURITE-OF,y=h(x): piece y,x)], $g_{\forall x(PIECE-PLAYED-IN-FIRST-AUDITION(x)=g(x))}$ ⟩

The resolution of the sluice is:

(337) ⟨ λ h[EVERY,Cellist(x), λ x(BE-FAVOURITE-OF,y=h(x): piece y,x)], h:− ⟩

Notice furthermore that the resolution we provide for the sluice like the resolution in independent uses suggests an explanation for the following datum:

(338) a. No cellist has a favourite piece.

b. # Oh yeah, what?

Similar to

(339) I know that no miners revolted, #but I don't know who.

The resolution proposed for an individual use of the sluice in (339) suggested that this was due to the incoherence of

(340) I know that no miners revolted, # but I don't know who the miners that revolted are.

Similarly, the proposed resolution of a dependent use of the sluice in (338) ties the infelicity to the infelicity of

(341) The piece that is no cellist's favourite is the one she played in her first audition.

4.3.6 Anaphora

Dalrymple 1989 has pointed out that (non-independent) uses of wh-phrases that give rise to pair-list responses can allow anaphora to the pair-list:[7]

(342) a. Q: Which employee wrote each manual?

b. A: Bill wrote man1, Jill wrote man2,...

c. Q2: Do they still maintain them?

The relevant reading of Q2 is the reading which is to be interpreted as 'For each X that wrote manual f(X), does X still maintain f(X)'.
Notice that similar anaphora can arise to a functional response:

(343) a. Q: Which employee wrote each manual?

b. A: The person who suggested it was needed.

c. Q2: Does he still maintain it?

We return to these examples in section (4.5.2), where we argue that against the viability of a modal subordination account, where the quantifier phrase 'each manual' is scoped *intersententially.*

4.3.7 Syntactic restrictions on dependent uses

Basic issue

We have proposed, informally for the present, that pair-list and functional responses arise when an interrogative phrase is used to specify a dependence. We have claimed that such dependencies lie at the heart of a general use type available for expressions, one instance of which is bound variable anaphora. In this use, the descriptive condition associated with the expression, which on deictic uses associates a unique entity satisfying the condition with the argument role filled by the expression, is used to

[7]This happens to be an instance of actually occuring data from a database query system.

impose a dependency between that argument role and some other argument role associated with an expression('the antecedent') within whose scope the former argument role lies, as in examples (318), repeated here as (344):

(344) a. (Every sports fan)$_{antecedent}$ in the country was at (a local bar)$_{dependent-expression}$ watching the play-offs. (Mitchell 1986)

b. (Every participant)$_{antecedent}$ had to confront and defeat (an enemy)$_{dependent-expression}$. (Partee 1989)

If the dependency that the interrogative is being used to specify includes in its descriptive condition the imposition of a dependency between argument roles associated with expressions, as in (345a), though not in the sluicing case in (345b):

(345) a. (Which employee)$_{dependent-expression}$ wrote (each manual)$_{antecedent}$?

⟨ λ h [EACH, MANUAL(x), λ x(WROTE,y=h(x): employee y,x)], h:– ⟩

b. Every cellist has a favourite piece? What? (No antecedent expression)

c. ⟨ λ h[EVERY,Cellist(x), λ x(BE-FAVOURITE-OF,y=h(x): piece y,x)], h:– ⟩

then it is predicted that this use of the interrogative must be constrained by the same basic condition controlling dependent uses of other expressions, namely that the argument role associated with the dependently used expression be within the scope of the argument role associated with the antecedent or depended upon expression. Since subject argument roles always have object argument roles in their scope, whereas the converse is only true for argument roles where the associated expression can scope over the subject, a corresponding subject/object asymmetry in the availability of dependent uses should arise.

In particular, conditions constraining scope relations between argument roles deriving from syntactic relations that must hold between the corresponding expressions (arguably c-command or leftness etc.) will constrain the availability of dependence

This seems to hold for the various types of expressions that can be used dependently, as the following example illustrate. We star sentences for which the intended dependent use is unavailable:

(346) a. *During superbowl weekend, *a local bar* was frequented by *every sports enthusiast.*

b. During superbowl weekend, every sports enthusiast frequented a local bar.

c. ? During superbowl weekend, *a local bar* was frequented by *each sports enthusiast.*

(347) a. *Every participant* had to confront and defeat *an enemy.*

b. ? *An enemy* had to confronted and defeated by *every participant.*

c. *An enemy* had to confronted and defeated by *each participant.*

(348) a. *John talked about *his application* to *every applicant.*

b. John talked to *every applicant* about *his application.*

Interrogatives used dependently show similar constraints, as first pointed out by May 1985:

(349) a. ?*Which theorist* proved *every lemma*?

b. *Which theorist* proved *each lemma?*

c. *Which lemma* did *every theorist prove?*

(350) a. *Which lemma* did *Gauss, Fermat and Riemann* (each) prove?

b. * *Which mathematician* liked *Gauss, Fermat and Riemann* (each)

4.3.8 Dependent uses of alternative phrases

We showed in section (4.2.8) that an alternative-phrase can manifest semantic properties identical to those of an independent use of a 'which-phrase' with a descriptive condition paraphrasable as 'is either (the referent) of alternative 1 or (the referent) of alternative 2'.

Alternative phrases can also give rise to pair-list and functional responses:

(351) a. Who does each person here admire, [Jill or Bill]?

b. Does each person here admire [Jill or Bill]?

c. Mike admires Jill, Mary admires Bill,...

d. Whichever one of the two has treated them nicer

(352) a. What does each of you want to drink, [tea or coffee]?

b. Does each of you want to drink [tea or coffee]?

c. Mike wants tea, Melissa wants coffee,...

d. The linguists want tea, the philosophers want coffee.

Contents for dependent uses of wh-phrases proposed above accommodate such responses:

(353) a. ⟨ λh [EACH, PERSON(x), λ x(ADMIRE,admirer:x,
admireed:y=h(x):y=**jill** ∨ y=**bill**)], h:– ⟩

b. ⟨ λh [EACH, PERSON(x), λ x(WANT,wanter:x,
wanted:y=h(x): y=**tea** ∨ y= **coffee**)], h:– ⟩

It is worth noting that similar subject/object asymmetries in availability of dependent uses appear to arise with alternative phrases:

(354) a. Does each person here admire [Bill or John]?

b. Does [Bill or John] admire each person here. (No pair-list or functional response)

4.4 Reprise uses of interrogatives

4.4.1 Introduction

In this section we discuss a third use interrogatives can undergo, one class of uses of which is utilised to 'echo' a partially misheard utterance. Since such uses typically involve a different intonational pattern from independent and dependent uses, we notate phrases used in this way using capital letters:

(355) a. Who likes WHAT?

b. You saw Billie do WHAT?

This does not reflect an assumption that such phrases are different *syntactic* expressions from interrogative phrases that are used in the other two ways. We adopt Bolinger's term 'reprise' for the class of queries that includes echo queries. We reserve the term 'echo' for the particular use resulting from mishearing a previous speech act.

Reprise uses of wh-sentences have received short shrift in much recent literature, either dismissed summarily as 'metalinguistic' and not genuine questions (see e.g. Cooper 1983, Engdahl 1986.), or assumed to involve an intrinsically different logical form (Janda 1985). Comorowski 1989 provides a number of important insights on the syntactic and semantic nature of reprise phrases, but in adopting the 'metalinguistic' label is lead to unnecessary levels of complication: assuming, for instance, that (355) denotes a property of properties of propositions. The only sense according to which one might call echo uses 'metalinguistic' is that the *contents* that arise from such uses contain as a constituent the illocutionary force of the utterance which they reprise. Beyond that, we claim, there is nothing fundamentally different going on, syntactically or semantically, from other interrogatory uses.

The main point we seek to establish, then, is the following:

- Reprise uses are *grammatical*: they involve syntactic and semantic mechanisms common to other interrogative uses.

The first issue we discuss concerns reprise uses of non-interrogative expressions, which we subsequently show extend to interrogative uses.

4.4.2 Reprise uses of non-interrogative expressions

Declarative sentences can be used assertorically by a speaker. Thus, as assertoric use of the sentence in (356a) can be *paraphrased* as in (356b), with a full illocutionary and descriptive content depicted schematically as in (356c):

(356) a. John Smith is annoyed.

b. Speaker asserts that John Smith is annoyed.

c. ⟨ ASSERT, asserter: s, speaker s ⟨ ANNOYED, annoyed-person: **john smith** ⟩ ⟩

Note that in analysing an assertoric utterance in this way, that distinguishes between an illocutionary force and a descriptive content (see section (1.4.2) for brief discussion of these issue with reference to interrogative meanings) we are explicitly *not* committed to assuming the syntactic realisation of the illocutionary components of meaning,[8] an assumption known as the 'performative hypothesis'.

We need not enter now into a characterisation of the illocutionary force *assertion* (see e.g. Austin 1950, Searle 1969, Stalnaker 1978, Barwise and Etchemendy 1987 among many.) Very roughly, an assertion involves the speaker *claiming* that the descriptive content of the utterance is true. In other words, it commits *her* to a certain picture of how things are. Thus, in asserting (356a), the speaker must have some grounds for her claim, seeing John Smith seethe, hearing dishes in his apartment roll to the floor etc.

But it is clear that not all uses of declaratives satisfy this schematic characterisation: when some speaker A asserts (356a) to some addressee B who knows nothing about John Smith's current state, and B retorts, typically, with rising intonation:

(357) He's angry.

then B certainly need not be committed to claiming that John Smith is angry: he has afterall no evidence for that beyond A's utterance. Thus, what B seems to be

[8] In fact, we shall also argue in section (5.5) against the assumption that all constituents of descriptive content are syntactically realised.

doing with the sentence is *reprising* A's utterance. Metaphorically speaking, throwing it back at A. What B seems committed to is that *A* is committed to the claim that John Smith is angry. We can paraphrase this as follows:

(358) a. (Reprise use) He is angry.

b. Speaker asserts that previous speaker asserted/said that he, John Smith, is angry.

c. ⟨ ASSERT, asserter: s, speaker s ⟨ ASSERT, asserter: t, previous speaker t ⟨ ANNOYED, annoyed-person: **john smith** ⟩ ⟩ ⟩

So instead of committing *himself* to the claim inherent in the assertoric descriptive content, the repriser commits himself merely to the fact that the speaker of the reprised utterance made such a claim.

Why would someone reprise a previous utterance? An important effect of the reprise is to draw attention to the the content of the original statement be it for the purpose of expressing incredulity, or, alternatively, in order to lay the *repriser* open to disagreement from the previous speaker as to the precise original content:

(359) a. I got a job today!

b. Reprise: You got a job today, wow.

c. Force of reprise: You say you got a job today.

(360) a. I'm arriving tomorrow at 2.

b. Reprise: You're arriving tomorrow the 15th at 2 p.m.

c. (force of reprise) You say you're arriving tomorrow the 15th at 2 p.m.

(361) a. He is annoyed.

b. (furls eyebrows) JOHN SMITH is annoyed?

c. (Force of reprise:) You say JOHN SMITH is annoyed.

We emphasise that the reprise *use* has a descriptive content similar to an assertoric use of a sentence identical in descriptive content to the one used in the reprised utterance that is embedded under a 'performative phrase'. But in so doing we explicitly do not intend this as a claim about any such *syntactic* structure in the sentence used as a reprise.

Note that reprises need not be string identical to the originally uttered string, but in terms of assertoric descriptive-content they will have a high overlap.

Not only assertions can be reprised:

(362) a. Go home now, Billy.

b. (Reprise) I should go home now.

Billy is clearly not asserting that he should go home, nor is he ordering himself to perform a certain action. He is committing the previous speaker to the order that she made:

(363) a. Go home now, Billy.

b. I order you to go home.

c. ⟨ ORDER, order-er: s, speaker s ⟨ GO, go-er: **billy**, location:home ⟩ ⟩

(364) a. I should go home now.

b. (force of reprise) You order me to go home now.

A reprise use of a declarative S in a context c_0 can be characterised, schematically, as follows:

1. A sentence S_0 whose illocutionary force is IF_0 and descriptive content is p has previously been uttered.

2. The descriptive content of S used in c_0 is $IF_0(p)$.

In other words, the reprised sentence is used to get at the illocutionary and descriptive content of a previous utterance. For what purpose? Various: including the expression of incredulity, affirmation and miscomprehension.

4.4.3 Reprise uses of interrogatives

Let us initially note that the same form and, roughly, similar intonation used to express the fact that an antecedent utterance was misheard can be used to do other things:

(365) a. A: Ooh, I *like* his coat.

B: You like WHOSE coat?

b. Well, anyway, I'm going there this weekend.

B: You're going WHERE this weekend?

These queries are instances of 'ref questions' (see Pope 1976), arising in this instance because of an unsuccessful act of deixis on the part of the first speaker.

(366) a. A: I'm moving in with Arnold Schwartznegger.

B: WHAT? You're moving in with who?!

b. A: I've just won the Nobel prize.

B: I can't believe it— You've just won what?!

This last set of examples illustrate a reprise used to express astonishment: in order for B's utterance to make sense, she *must* have understood A's original utterance.

Thus, just like reprise uses of declaratives, reprise uses of interrogatives can be utilised for a wide range of purposes, only one instance of which concerns the *form* of the previous utterance.

The most obvious reason for the belief that echo uses are 'metalinguistic' is the belief, erroneous as we shall see in the next section, that in a wh-fronting language like English, a unary wh-sentence in which the wh-phrase is *in situ* cannot be used to make an 'information query'. In other words, its only use is to make reprise queries. Hence, goes the argument, it is a sentence of dubious grammatical pedigree. The point we will try to make clear is that reprise uses of an interrogative sentence *are* queries in which information is requested, the sole difference is that the descriptive content

of such a query is different from the descriptive content of either an independent use or a dependent use of the same form of words.

The main grounds for our claim is that, subject to certain syntactic constraints, reprise sentences can be paraphrased by *independent* uses of entirely 'normal' fronted interrogative sentences:

(367)

You like WHO?

Who did you say (just now) you like?

(368) a. (Go home Billy!) Go WHERE?

b. Where did you order me (just now) to go?

(369) a. Who likes WHAT?

b. ? What did you ask me (just now) who likes? [Violation of wh-island]

Similarly, reprise uses can be reported by embedding an interrogative under *ask*, just like other queries:

(370) a. Jill:You like WHO?

b. Jill was amazed at what I told her, so she asked me who it was I had said I liked.

(371) a. (Go home Billy!) Go WHERE?

b. Bill couldn't believe his ears, and asked, utterly incredulously, where I had ordered him to go to.

The only difference between a reprise use of a declarative and a reprise use of an interrogative is that in the latter case one or more of the constituents of the previous content is not reprised, but left *unresolved* by associating that argument role with an interrogative phrase:

(372) a. John Smith is angry with Bill.

b. Reprised: He's angry with Bill, huh.

c. Paraphrase of reprise: You assert/say that he, John Smith, is angry with Bill.

d. Descriptive content of reprise: ⟨ ASSERT, asserter: s, previous speaker s ⟨ ANNOYED, annoyed-person: **john smith**, object-of-annoyance: **Bill** ⟩ ⟩

e. Full illocutionary and descriptive content:⟨ ASSERT, asserter: t, current speaker t ⟨ ASSERT, asserter: s, previous speaker s ⟨ ANNOYED, annoyed-person: **john smith**, object-of-annoyance: **Bill** ⟩ ⟩ ⟩

(373) a. John Smith is angry with Bill.

b. Reprised: He's angry with WHO?

c. Paraphrase of reprise: Who did you assert/say that he, John Smith, is angry with?

d. Descriptive content: ⟨ λx ⟨ ASSERT, asserter: s, previous speaker s ⟨ ANNOYED, annoyed-person: **john smith**, object-of-annoyance: x ⟩ ⟩ x:–⟩

e. Full illocutionary and descriptive content: ⟨ QUERY, ⟨ λx ⟨ ASSERT, asserter: s, previous speaker s ⟨ ANNOYED, annoyed-person: **john smith**, object-of-annoyance: x ⟩ ⟩ x:–⟩ ⟩

So, if a reprise use of a declarative S in a context c_0 was characterised, schematically, as follows:

1. A sentence S_0 whose illocutionary force is IF_0 and descriptive content is p has previously been uttered.

2. The descriptive content of S used in c_0 is $IF_0(p)$.

then a reprise use of an interrogative S is characterised identically, save for the fact that one or more of the argument roles of the original content are left unfilled. For a reprise involving a unary interrogative:

1. A sentence S_0 whose illocutionary force is IF_0 and descriptive content is p has previously been uttered.

2. The descriptive content of S used in c_0 is $\langle\ \lambda\ \mathrm{x}\ IF_0(p(x))\ \mathrm{x}{:}-\ \rangle$.

Two things should be clear: on the one hand, the descriptive content of a reprise use of an interrogative sentence is an unresolved SOA just like any other interrogative content, which is then input to the standard illocutionary query operator, whose features and responsehood characteristics were discussed in chapter 1.

(374) a. QUERY(q_0), where q_0 is the descriptive content of the reprise use.

b. 'Please provide a response r that satisfies Response(r,q_0)'

On the other hand, the 'wide scope' property of roles associated with reprise uses of interrogative phrases is a direct consequence of the nature of an interrogative reprise, namely that those argument roles are left unresolved.

There is absolutely no mystery, then, why a reprise use of an wh-phrase can scope over other, independently used wh-phrases:

(375) Who likes WHAT?

Here we have what has been called a 'second order' question: in fact nothing additional has to be said for such contents beyond the usual issues concerning interrogatory content embedding: since the previous speaker *asked a question*, the illocutionary force of his utterance is interrogatory. Such a use can be paraphrased by the wh-island violating sentence:

(376) What did you ask who liked

The descriptive content of such a use, then, is:

(377) ⟨ λx ⟨ ASKED, t,λy ⟨ LIKE, liker: y, likee:x ⟩ y:– ⟩ x:–⟩

Similarly, if we assume that in independent uses two roles associated with interrogatives do not scope each other (see the discussion of Bach Peters cases in section (4.2.5)), this transfers directly to cases like

(378) a. You gave WHAT to WHOM?

b. ⟨ λx,y ⟨ SAID, t, ⟨ GAVE, giver: t, recip:x, obj-given:y ⟩ ⟩ x:–,y:– ⟩

4.4.4 Syntactic constraints

The basic issue

One of the main reasons that researchers have assumed reprise uses to be 'metalinguistic', or 'extra-grammatical' is the belief that whereas strong syntactic constraints exist on the interrogative expressions that can have independent (and dependent) uses, with reprise uses 'anything goes'. We have already shown that as far as their semantics go, reprise uses make use of the same basic mechanisms as other interrogative contents. What we seek to point out here is that a similar point applies to the syntax: many of the *syntactic* constraints on dislocation of interrogative phrases also apply to reprise uses. Forms violating these constraints can be used neither independently *nor* to reprise. The converse point, that many if not most interrogative forms that can be used to reprise can be given independent uses will be established in the next section.

Before we proceed to establish the first point, it is worth emphasising one important distinction, namely the availability of reprise uses of forms provided by grammar, from reprise uses of 'extra-grammatical' forms. It is commonly assumed that not all strings of morphemes that speakers of the language use should be considered 'grammatical': various starts, repairs, ellipses etc. are used that, for various metatheoretical reasons are assumed outside the domain of 'grammatical competence'. How to draw this line is, clearly, a thorny issue. Such issues apply with especial force to domains of 'discourse grammar' such as gapping and ellipsis. Not surprisingly, such issues crop

up with forms that can be used to reprise, since its quotative nature associates it, typically, with fairly informal settings.[9]

What the data we provide now shows, nonetheless, is that such a line does need to be drawn for reprises as well. Moreover, we will show in the next section that this line cannot be drawn with respect to availability of independent or dependent uses of interrogatives: in other words, if one assumes that all non-fronted unary wh-sentences in a language like English are not forms that the grammar has to generate, then this decision cannot be made because independent (or dependent) uses of *in situ* interrogative-phrases are unavailable. They quite clearly are available.

[9]The following datum, due to Janda 1985, has been taken as evidence by many for the 'metalinguistic' nature of reprise uses:

(379) A: I've been reading a bit recently about trfxjacency.
B: Sorry, you've been reading about WHAT-jacency?

So, reprise uses can, apparently, enter at a subsyntactic level. Janda takes this as support for an approach which assumes sentences used to reprise are assigned contents that vary over linguistic *strings*, essentially assigning an LF 'which string x have you been reading about x-jacency' to (379).

We believe this is an altogether hasty conclusion: most obviously it cannot accommodate the fact that even echo's can be responded quite felicitously by restating the same content using a different form:

(380) A: I like Vyachoslav Voinovich.
B: (Sorry,) you like WHO?
A: The guy you met at the reception.

It can also not accommodate non-echo reprises, such as 'ref-queries' or expressions of astonishment, which we saw above. In any case, we feel somewhat skeptical as to the status of (379) as a well formed string of *English*. Rather, we would view it as some kind of extension of the language, a play on words, in a sense discussed at some length by Pullum and Zwicky 1988? with respect to derogatory 'schm' ('bagels, schmagels'), borrowed from Yiddish into English. Be that as it may, it seems that whoever accepts (379) as a *bona fide* sentence of English, would accept a sentence such as the following:

(381) I've been reading about subjacency, abjacency etc. In short, a wide range of (pauses) jacencies. Now you tell me: What kind of jacency have *you* been reading about?

which expresses a non reprise query. It should be obvious that the fact that it explicitly concerns a class of concepts sharing some morphological property is merely a consequence of its punful nature.

Constraints on reprise uses of fronted forms

Comorowski 1989 provides some important data from Romanian indicating the grammatical authenticity of wh-phrases used to reprise. Romanian is a language where the standard wh-interrogative sentence strategy involves the fronting of all wh-phrases. Unary wh-sentences where the wh-phrase is not fronted are apparently ungrammatical: they cannot be used independently or to make reprise queries. Multiple wh-sentences containing unfronted wh-phrases are quite marked, apparently: they can be used only to make reprises of queries ('Who likes WHAT' cases), and also in disjunctive contexts ('Bill phoned Mary or Mary phoned Bill', so tell me who actually phoned whom?'),[10] which we discuss in detail in chapter 5.

Comorowski shows that regardless of the use they are put to, including reprise uses, constraints on dislocation such as the coordinate structure constraint, the CNPC, and the unit-movement constraint are maintained:

(382) a. *Ce$_i$ vâ intrigâ zvonul câ ar fi cumpârat t$_i$?

WHAT you (acc.) intrigues rumour-the that he-may be bought? (CNPC)

b. *Cine$_i$ a venit Iolanda si t$_i$?

WHO has come Iolanda and? (Coordinate structure constraint).

c. *Ce$_i$ a gâsit[needs reverse circonfl] t$_i$?

WHAT he-has found a? (Unit movement constraint.)

When an interrogative phrase is used to reprise it does not show weak crossover effects. Comorowski, following Heim 1982, accounts for this, roughly, by construing WC as a symptom of definiteness. Similarly, forms violating the Wh-island constraint can also be used to reprise, though apparently independent uses of such forms are also available in certain contexts. The *syntactic* status of this particular constraint has been challenged in recent times, in part because it seems to be violable in certain

[10]The possibility of this use of such sentences was indicated to me by Anna Szabolsci (p.c.) on the basis of data provided to her by Comorowski (p.c.).

contexts in a number of languages. See Engdahl 1986 for Swedish, Comorowski for Romanian.

Similar facts hold for English: reprise uses do not license forms that violate various constraints on movement:

(383) a. *WHAT$_i$ does the rumour that he might have bought t$_i$ intrigue you? (CNPC/subject condition)

b. * WHO$_i$ do you like Iolanda and t$_i$? (Coordinate structure constraint).

c. *What$_i$ did he find a t$_i$? (Unit movement constraint.)

Putting all this together, Comorowski concludes, persuasively we think, that there is no reason to assume that wh-phrases used to echo are different *qua* syntactic expressions from wh-phrases used otherwise. In other words, there is no motivation to posit syntactic ambiguities solely to distinguish the availability of a reprise use from a non-reprise use. This does not force one into the conclusion that all interrogative forms that can be used to make reprises can be used independently or vice versa, just as not all forms that have independent uses have dependent uses:

(384) a. *Who knows WHERE the boys bought what?

b. Who went to the store with Bill and WHO?

(384a) cannot be used to make a reprise, whereas, for many speakers, (384b) can only be used to reprise. We will not enter into the issue of the nature of the constraints on grammatical interrogative forms that cannot be used to reprise, but will show in section 4.5 that the converse issue, which forms can be used to reprise but not independently, is not directly linked to the issue of whether the interrogative phrases are fronted or not.

4.4.5 Adverbs

Reprise uses also show the same lack of scopal interaction with adverbs of quantification exhibited in independent uses:

(385) a. You seldom used to go out with WHICH PERSON? (query has force: 'Which person did you say you seldom went out with.' wh-phrase does not get force of 'seldom'.)

b. Jill seldom used to go out with an attractive woman. (indefinite can be scoped by 'seldom'.)

(386) a. A quadratic equation usually has HOW MANY solutions? (query has force: ' How many solutions did you say a quadratic equation usually has?' wh-phrase does not get force of 'seldom'.)

b. A quadratic equation usually has two solutions.

('two solutions' can be scoped by usually.)

4.4.6 Anaphora across scope-islands

Reprise uses can give rise to anaphora across scope islands. These appear to be resolved, like in independent uses, using an E-type-like mechanism:

(387) a. I didn't quite catch that: You saw the thief make off with WHAT thing? Where did he put *IT/that thing*?

b. Where did the thief put the thing that you said he made off with?

c. You saw the thief make off with what thing that he put where?

The reading the assertion in (387a) appears to get is the one in (387b), rather than the one in (387c). This latter content is the reading that would arise were we to assume that the role associated with the interrogative phrase scopes intersententially: if we use bound variable anaphora, and wh-expressions are scopeless, then the the content of the discourse will no longer contain a query followed by an assertion, rather it will become one compound unresolved SOA with a reading as in (419c).

4.4.7 Sluicing

Sluices can also be used to reprise:

(388) A: I like Vyachoslav Voinovich.

B: WHO?

(Sluice is resolved to:) Who did you say you like?

(389) a. A: Ooh, I *like* his coat.

B: Whose coat?

b. (Sluice is resolved to:) Whose coat did you say you like?

(390) a. (Go home Billy!)

b. WHERE?

c. Where did you order me (just now) to go?

Note that in all these cases, the sluice seems to be resolved to a content identical to that of a reprise use of the 'reconstructed' sentence. This suggests that were sluicing of reprises to be syntactically based, it would involve utilising something like the performative hypothesis.

4.4.8 Reprise uses of alternative phrases

Constituent alternative sentence can also be used to reprise:

(391) a. A: Ooh, I *like* his coat.

B: [John's or Bill's]?

(392) A: I'm really disappointed with him.

B: [John or Bill]?

(393) A: Who likes ...?

B: Sorry, didn't quite catch that: Who likes [Jill or Sally]?

4.5 Independent uses and (non)wh-fronting

4.5.1 Biassed contexts and unfronted unary interrogative sentences

In this section we consider the status of sentences like

(394) John likes who?

It has commonly thought that such sentences can only be used to make reprise queries, and/or that the syntax and semantics of such forms are outside the purview of the grammar. In the Principles and Parameters framework, this is supposed to be regulated by the θ-criterion: no phrase that is functionally an operator can remain in an A-position at LF, so in effect Quantifier Raising applies obligatorily to quantificational expressions, which interrogatives are assumed to be. Engdahl 1986 voices similar sentiments:

> Because of their semantic type, wh-phrases cannot contribute directly to the meaning of a VP or NP...We take it to be that the reason we cannot interpret a VP like *kissed who* is that the meaning of *who* is not of the right type to combine with a transitive verb like *kiss*. Rather *who* is a quantifier which necessarily takes scope over a sentence. (Engdahl 1986 p. 72)

Given our discussion in the previous section, where we showed that reprise uses were clearly *bona fide* grammatical entities from a semantic and syntactic point of view, it should be clear that even if sentences such as (394) could only be used to reprise, this would not mean that such sentences need not be generated by the grammar. However, we show that the assumption that sentences like (394) have only reprise uses is *false*. We provide one general sufficient condition on a context that can license independent uses of such sentences. We do, nonetheless, provide some indication of why even in such contexts, these forms are rather infrequently used.

In section (1.4.2), we proposed partitioning the space of contexts for uses of interrogatives relative to how resolved the issue described by the question prior to its

asking is: a common ground (henceforth 'context', for the current section) can be *neutral*, *biassed* or *resolved* with respect to a given issue, in a sense which we made precise. We showed in section (1.2.5) that contexts in which the issue is resolved cannot be used for interrogation, but can be used to make assertions by *exploiting* the question. As we discussed in section (4.2.2), fronted unary wh-phrases can be used in *neutral* contexts. It is clear that in a neutral context, an unfronted unary wh-sentence is, for the most part, infelicitous.

4.5.2 Biassed contexts

A context is *biassed* iff it is neither neutral, nor resolved. That is, it contains a partial answer to the question. The preparatory condition on queries places an upper bound on what a positive context can contain, roughly, 'A context for a query q cannot contain an answer to q that is potentially maximal.' For wh-questions, this means that positive contexts can contain quantificational answers, typically existential answers, that is ones that indicate that the question has positive instantiations.

Consider the following examples:

(395) a. A: Well, anyway, I'm leaving.

B: OK, so you'll be leaving when exactly?

b. A: I'm in love.

B: Aha. You're in love with whom?

(396) A: My friends, they saw everything.

B: Yeah, they saw what? (CBS Sat. night movie, Jan 25 1992)

It is quite evident in all these cases B has heard and fully understood A's utterance. On the basis of the information that it provides, she proceeds to query for specific information, in other words, making an independent use of the wh-phrase. These can *not* be analysed as reprise uses. The paraphrase in (397), argued for in section (4.4) as applicable to reprise uses, is clearly not what the above questions mean:

(397) a. When did you say you were leaving?

b. Whom did you say you were in love with?

c. What did you say your friends saw?

Moreover, the biassed nature of the context does not depend on a use of an overt linguistic expression carrying the existential presupposition:

(398) (Alicia pokes head in office occupied by Belinda, who is commonly known to be leaving the area shortly:) Say, Belinda, you're leaving when exactly?

(399) (Denis pokes head in office occupied by Alicia. The two have previously committed to a joint activity of unspecified nature the following day:)

Denis: We're going out tomorrow, right?

Alicia: I guess so. And we're going to do what exactly?

So, in a biassed context, an unfronted unary wh-question can have a non-reprise use. Nonetheless, dialogues like the following are uncommon:

(400) a. A: I met someone in the office today.

b. You met who in the office today?

(401) a. Bill told me that Mike claimed someone broke into his office.

b. (Bill told you that) Mike claimed that who broke into his office?

Why? We believe the following pragmatic fact might play a crucial role in an explanation of this phenomenon: there exists a form that is briefer and more specific, namely a sluice, that can be used in any such biassed context:

(402) a. A: I met someone in the office today.

b. Yeah, who?

(403) a. Bill told me that Mike claimed he found something in his office.

b. Hmm, what?

Recall that we have provided extensive evidence that sluicing does *not* involve *syntactic* reconstruction/deletion/identification of an elided constituent.

For instance, for an independent use of the sluice:

(404) a. Someone came into the office. Who?

b. Who (is he, the person that came into the office)?

The sluice, then, in addition to being briefer is more specific:

(405) a. A: I met someone in the office today.

b. You met who in the office today?

c. Who (is the person you met in the office today)?

(406) a. Bill told me that Mike claimed he found something in his office today.

b. (Bill told you that) Mike claimed that he found what in his office today?

c. What (is the thing that Bill told you that Mike claimed that he found in his office today)?

Note that this 'blocking' account transfers only partially to reprise uses, given that reprise sluices get resolved to yield a content identical to the 'reconstructed' reprised content, as was pointed out in section (refsection4.5):

(407) a. I met John Petrowskovich in the office today.

b. WHO (did you say you met in the office today)?

(408) a. I met John Petrowskovich in the office today.

b. You met WHO in the office today?

c. Who did you say you met in the office today)?

The only advantage sluicing has in such a case is brevity, whereas since in such cases, it is often unclear which argument role is serving as the antecedent argument role, the longer form is less liable to be ambiguous:

(409) a. I saw Sally Chu and Millie VanNess at the theatre tonight.

b. WHO?

c. You saw WHO and Millie VanNess at the theatre tonight?

d. You saw Sally Chu and WHO at the theatre tonight?

e. You saw WHO at the theatre tonight?

4.5.3 Neutral contexts, topic and focus

Although we have shown that a context being biassed is a sufficient condition for the felicity of an unfronted wh-interrogative sentence, it is plausibly not a necessary condition.

(410) a. Those bagels, I like.

b. I like those bagels.

c. What do you like?

d. You like what?

Whether the declarative sentence in (410a) or the closely related sentence (410b) are used in a given context depends on the topic/focus structure of the discourse. Analogous, though not identical remarks apply to the two wh-interrogative sentences (410c,d). Roughly, the former is more appropriate in a neutral context to introduce a topic, whereas the latter is preferred once the topic is established. We will not pursue making these matters more explicit in the current work, beyond noting a number of

examples that suggest the plausability of this direction. Whatever felicity account can be argued to apply to the topicalisation structure, plausibly it does not concern the denotational nature of the topicalised NP. Similar remarks apply in the wh-sentence case *mutatis mutandis*.

What this direction for explanation suggests is that if a topic can be accommodated, explicitly or implicitly, into the context by other means, then the *in situ* sentence can be felicitous.

(411) a. (Post-maritally blissful speaker):We're going to buy a house.

(Skeptical in-law): Uh huh. And you're going to pay for it with what?

b. With what are you going to pay for it?

In (411), due to Bolinger 1978, the first statement establishes as a fact of the discourse situation the buying of a house. This makes the issue of payment for the house fairly accessible for accommodation, and hence licenses the *in situ* wh-sentence, which appears to carry a different force than the corresponding fronted sentence.

Similar remarks apply to the following examples:

(412) Mr Staples says that in a presumably more responsible past film makers changed names or added disclaimers to their productions. And the results were what?' (NY Times 10 Jan 1992)

In conclusion, we note that the factors disfavouring use of unary, unfronted wh-sentences in English appear to be linked with the differential specificity of sluices, and some factor, unresolved for the present, that concerns the informational structuring of context.

4.6 Summary of properties common to uses of interrogatives

In the previous sections we have provided data characterising three different uses associated with surface interrogative forms. We note the following properties common to these uses:

- All three uses can arise through sluicing, which can also be resolved without overt linguistic antecedent.
  - Independent use:

    (413) a. Some person entered each office today. Who?
    b. Who (is he, the person that entered each office today)?
    c. Houdini, of course.

  - Dependent use:

    (414) a. Some person entered each office today. Who?
    b. Who (is he, the person that entered each office today)?
    c. Sam Sneed entered office A, Sherlock entered office B,...
    d. The person who was supposed to clean it.

  - Reprise use:

    (415) a. (Go home Billy!)
    b. WHERE?
    c. Where did you order me (just now) to go?

- All three uses license interscopal anaphora:
  - Independent use:

    (416) a. *Where* were you born? Does your family still live *there*?

  - Dependent use:

    (417) a. Q: Which employee wrote each manual?
    b. A: Bill wrote man1, Jill wrote man2,...
    c. Q2: Do they still maintain them?

    (418) a. Q: Which employee wrote each manual?
    b. A: The person who suggested it was needed.
    c. Q2: Does he still maintain it?

- Reprise use:

(419) a. I didn't quite catch that: You saw the thief make off with WHAT thing? Where did he put *IT/that thing*?

b. Where did the thief put the thing that you said he made off with?

- All uses can arise with alternative phrases:

- Independent use:

(420) a. Does each person here have [Jill or Bill] as a role model?

b. I believe it's Bill.

- Dependent use:

(421) a. Does each person here have [Jill or Bill] as a role model?

b. Mike has Jill, Mary has Bill,...

c. Whichever one of the two has treated them nicer

- Reprise use:

(422) A: Who likes ...?

B: Sorry, didn't quite catch that: Who likes [Jill or Sally]?

This data shows that

- Anaphoric possibilities across scope-islands are unaffected regardless of the type of use, though the anaphora is resolved differently according to the use type.
- All three uses can arise with forms, alternative phrases, that are not dislocated on the surface and are licensed in positions from which extraction is not possible.
- All three uses are available with forms, sluices, in which the plausability of generating scopal ambiguities is low.

Consequently, the difference in use type is hard to derive from either syntactically or semantically based scopal ambiguities, or from the existence of lexically distinct traces of movement.

Chapter 5

Interrogatives as quantifiers: an appraisal

5.1 Quasi-Quantificational systems

In this section we discuss 'quasi-quantificational' approaches to interrogative phrase meaning, primarily wh-phrase meaning: this includes such works as Karttunen 1977, Engdahl 1980, 1986, Groenendijk and Stokhof 1984, 1989 and Higginbotham and May 1981.

The basic characteristics of such systems for *unary* wh-sentences are these:

1. The semantic contribution of each Wh-phrase is a variable, a restrictive property and a binding operator.

2. The semantic type of an interrogative sentence is distinct from the type of declaratives. We denote the former with q, the latter with t.

3. An unary interrogative content is formed by means of a 'Wh-quantification (WHQ) rule that maps an open proposition to an object of type q:[1]

   (423) a. Wh-Quantification (WHQ): Wh-det maps a property and a propositional-function to a question-obj, a (non-propositional) object of type q.

[1] In the case of Groenendijk and Stokhof, the input to the rule is (the denotation of) what they call an *abstract*, a property.

b. Wh:(Prop-Functions x Restr-Properties) → Question-Obj

$Wh_i[Restr - Property](P(\ldots t_i \ldots))$

c. Possible Question-obj's: property of propositions (Hamblin, Karttunen, Engdahl), partition (class) of worlds (Groenendijk and Stokhof), set of theories (Higginbotham and May) etc.

The motivation in constructing systems of this type is that they capture the scopal variability of wh-phrases, while at the same time place strong limits on such scopal interaction. The characteristics we have mentioned above allow for

- **Simple accounts of the ability of wh-phrases to scope at both matrix and embedded interrogative levels.** This is because quantifying in can apply either at the embedded interrogative level or the matrix interrogative level :

(424) a. Who does Bill believe that Mary likes.

b. Bill knows who Mary likes.

- **Limiting scopal interaction of wh-phrases**: since q, the semantic type of an interrogative, is distinct from t, no expression that scopes over a propositional content can be assigned scope wider than the scope of the wh-phrase, simply on the basis of a WHQ rule as stated above:

(425) a. Quant_j $[_{Non-Propositional-function}$ $Wh_i(P(\ldots t_i, \ldots t_j))]$

b. Wh:(**Propositional-functions** x Restr-Properties) — Question-Obj

In (425), Quant_j is a quantifier that requires as its scope a propositional function. Hence, without a type-shifting operation, it cannot be scoped into an interrogative content (containing possibly free variables.)

This could provide a basic account of contrasts of the type we saw in section (4.2.6):

(426) a. Which regular customer rarely tips big?

b. A regular customer rarely tips big.

Given the apparatus at hand, 'rarely' can take widest scope over a nominal quantifier (or indefinite) as in (426b), but not over a wh-phrase as in (426a). So, the wide-scope which the argument role associated with an independent use manifests is accommodated.

The interesting issues, and problems, that WHQ approaches face arise with respect to multiple wh-sentences, dependent uses. Reprise uses are, for the most part, assumed not to require treatment within the grammar, an assumption we believe to have shown is questionable.

In Chapter 1, we demonstrated in some detail the many problematic and undesirable features of the assumption that interrogative contents are non-propositional in type (Non Propositional Interrogative Content, NPIC for short), but rather supra-propositional entities of some kind. We showed the various advantages to be gained by assuming that interrogative sentences are propositional entities of a sort. Consequently, the main interest in discussing WHQ approaches concerns the other main assumption of WHQ, that wh-phrases are quasi-quantifiers, expressions that make their semantic contribution by being quantified in.[2]

The assumption that wh-phrases are quantifiers is motivated to a large extent by the existence of non-independent uses of wh-phrases: in entirely neutral terms, cases where an argument role associated with a wh-phrase appears to be scoped with less than widest scope within an interrogative content (i.e. ignoring cases where an interrogative content is embedded as a complement.) The main phenomena evincing this are the existence of functional and pair-list responses:

[2]Groenendijk and Stokhof call their system non-quantificational, but this is, at least in part, due to the highly abstract syntax they use: basic sentences are sentences in which the roles associated with interrogatives in surface structure are associated with indexed pronouns. From these by a series of replacement operations the actual sentence is constructed. The semantic rules corresponding to these replacement operations involve abstraction which creates relations, followed by abstraction over indices denoting possible worlds, which creates partitions over possible worlds. Interrogative phrases in their system intrinsically scope over each other in a way that disallows, for instance, crossing co-reference.

(427) a. What piece does every cellist like most?

b. The piece she played in her first encore.

c. Jacqueline du Pre liked the Elgar, Harel the Mendelsohn sonata,...

(428) a. Which cellist likes which piece?

b. Jacqueline du Pre liked the Elgar, Harel the Mendelsohn sonata,...

The approaches we have mentioned above differ in the accounts they offer for uses that elicit such responses. We consider first such uses in unary wh-sentences. The first approach we examine is one that assumes that all non-independent uses arise by quantifying into an interrogative content.

5.2 Quantifying into unary wh-sentences

In this category one can include works such as Karttunen and Peters 1980, Bennett and Belnap 1982, Higginbotham and May 1981, May 1985.[3] The basic idea of this approach is that a pair-list response to an interrogatory use of a sentence such as

(429) What piece does every cellist like most?

arises by quantifying 'every cellist' with scope over 'what piece'. Schematically:

(430) Every cellist$_x$ (What piece$_y$ (x likes-most y))

Note that given the Non Propositional Interrogative Content assumption of all these approaches, they require a special 'quantifying into wh' (WHQI) rule, for the reason we mentioned above: 'every cellist' requires as its scope a propositional function, while the content into which it is quantified is non-propositional. So, the 'quantificational nature' of wh-phrases is *a priori* different from that of nominal quantifiers where no such rules are needed regardless of the number of quantifiers quantified in.

[3]Groenendijk and Stokhof recognize the existence of a functional use distinct from one giving rise to pair-list responses. But they do assume that pair-list readings arise by quantifying into interrogative contents.

Given the fact that the current approach rejects NPIC, the need for WHQI rules would not arise were we to adopt the assumption that pair-list uses arise by such a quantifying in. However, we will argue against assuming this to be the source of such readings. We start with a point originally made by Engdahl, namely that quantifying in cannot serve to account for functional responses. The force of this as an intrinsic problem for quantifying in is sharpened when we reiterate data provided in section (4.3.6) against assuming pair-list and functional responses to derive from different contents. Moreover, we show that correlating even just pair-list responses with quantifying in is implausible, because such responses can occur with contents where the plausible candidate expression for quantifying in is not otherwise assumed to be quantificational, or most strikingly because no such expression exists.

5.2.1 Quantifying in and functional responses

Engdahl cognitive argument

(431) a. (Even if you've never met many,) Which person do you believe each graduate student depends on the most?

b. (Even if you've never met many,) Which person do you believe most graduate students depends on the most?

c. (Even if you don't know them personally) Which person do you believe Tom, Dick and Jerry depend on the most?

Engdahl 1980 pointed out that queries using sentences such as the above can be *answered*, not just responded to, in the absence of specific knowledge about the fillers of, what is in this case, the argument role associated with the subject, where a *different* advisor is supposed to exist for each (or most) graduate student(s) or member of the group consisting of Tom, Dick and Jerry:

(432) a. Her advisor.

b. Their advisor.

Scope violation of functional response

Moreover, if we assume such interrogatives arise by quantifying in we are forced to give up the assumption that the scope of quantifier expressions is strictly sentential or is restricted by surface c-command or leftness:

(433) Which person do you believe every graduate student depends on the most? Her advisor.

(434) a. Their advisor is the person I would guess most graduate students/Tom, Dick and Jerry depend on the most.

b. Her advisor is the person I would guess each graduate student depends on most.

5.2.2 Pair-lists and Quantifying In

We now proceed to argue that correlating even just pair-list responses with a content arising from quantifying in is problematic.

Pair-list readings arise with non-quantificational antecedents

(435) a. Which goal do Mark Hughes, Ryan Giggs and Brian McClair (each) cherish having scored?

b. Ryan Giggs cherishes his first goal in an FA cup match, Brian McClair chrishes the goal he scored on his debut, and Mark Hughes likes 'em all equally.

(436) a. Which lemma did Gauss, Fermat and Riemann (each) prove?

b. Gauss proved the snake lemma, Fermat proved his little theorem....

The examples in (435,436) show that plural antecedents can license pair-list responses. Recent research on plurals explicitly assumes plurals to be referential expressions on a par with singular proper names (see e.g. Link 1983, Landman 1989)

In other words, assuming a pair-list response arises from a quantified in interrogative content requires the assumption that in these instances the plural expressions are quantified in with scope over the interrogative.

Anaphora

Consider once more examples due to Dalrymple 1989, first discussed in section (4.3.6):

(437) a. Q: Which employee wrote each manual?

b. A: Bill wrote man1, Jill wrote man2,...

c. Q2: Do they still maintain them?

The relevant reading of Q2 is the reading which is to be interpreted as 'For each X who wrote manual f(X), does X still maintain f(X)'.

Dalrymple suggested an account of the anaphora in the pair-list case based on 'modal subordination' in which the quantifier phrase 'each manual' is scoped *inter-sententially.*

We note first that this proposal will not extend to examples involving functional responses, assuming, as seems inevitable for such cases, these are not results of quantifying into interrogative contents:

(438) Which employee wrote each book? The person who suggested it was needed. Does he maintain it?

Q1 has the following rough content, in which 'each manual' scopes *narrower* than the dependency variable:

(439) $\langle \lambda$ h [EACH, MANUAL, λ x(WROTE,y=h(x): employee y,x)], h:– $\rangle$

Returning to the pair-list case in (437): if 'each manual' binds 'them' we have a violation of singular number agreement that 'each' usually enforces.

The main problem, however, for any account of the anaphora based on a 'family of questions' as in:

(440) ⟨ EACH, MANUAL, λz ⟨ λ y ⟨ λx ⟨ WROTE, writer:y, employee y written-object:x ⟩ x:z ⟩ y:–⟩ ⟩

is that it cannot provide an account of the anaphora *directly* on the basis of the content of the question, which preserves the specific dependencies provided in the pair-list response. Presumably, in order to account for the anaphora, it will have to make recourse to a skolem-ising device that can be used to describe the pair-list dependency, hence implicitly exploiting a dependency, explicitly provided for in the dependent use analysis.

It is beyond the scope of the current work to provide an explicit proposal that accounts for the possibility of the anaphora: we will indicate, nonetheless, a plausible direction to explore that accounts in a unified way for the anaphora possibilities of both functional and pair-list responses.

Assuming the pair-list and functional responses are due to a dependent use of the wh-phrase, Q1 has the following rough content:

(441) ⟨ λh [EACH, MANUAL, λ x(WROTE,y=h(x): employee y,x)], h:– ⟩

The responses provide as subsequents for the unfilled dependency, a function f_0 satisfying the property λ h [EACH, MANUAL(x), λ x(WROTE,y=h(x): employee y,x)]

How do we generate Q2 ? For simplicity, we ignore the y/n aspect of it and treat it like a regular proposition. The basic paraphrase we assume for it is this:

(442) He, (dependency supplied in response), is still the maintainer of each manual.

So, the outstanding problem is motivating the resolution of the 'it' in the functional case, and the 'them' in the pair-list case, as 'functional E-type' anaphora. If that can be done, the prospects for an account of this type appear to be reasonable: the content of the VP in both cases will be just like the Geach sentences discussed in section (4.3.5):

(443) λ h [EACH, MANUAL(x), λ x(STILL-MAINTAINS, mantainer:y=h(x): employee y,x)]

We assume that in both the pair-list anaphora and the functional anaphora, this property is predicated of the function supplied by the response. The difference in number of the pronoun is, presumably, correlated with the difference in the way the function is conveyed in the two types of responses. The content of Q2 is, then, ignoring its y/n aspect:

(444) ⟨ λ h [EACH, MANUAL(x), λ x(STILL-MAINTAINS, mantainer:y=h(x): employee y,x)] h: f_0 ⟩

Sluicing

(445) a. Every cellist has a favourite piece.

b. Oh yeah, what/which one?

c. The piece she played in her first audition.

d. Jacqueline du Pre liked the Elgar, Ofra Harnoy the Dvorak,...

(445) indicates that sluicing can give rise to both functional and pair-list responses. The sluice seems to be resolved to a reading where 'the thing that is every cellist's piece' is used *functionally*:

(446) What is (the thing that is) every cellist's favourite piece?

The resolution does not correspond to the content of any plausible surface constituent in the antecedent. Even if motivation could be provided for such a constituent on a more abstract level for the *antecedent*, the data we have seen in previous sections, not least the possibilities of extra-linguistic resolution of the sluice indicate strongly that that if any syntactic element does exist which constitutes an elided constituent, it *is* null, not a product of deletion or reconstruction. This suggests quite strongly that pair-list responses can arise from interrogative contents lacking constituents whose semantic contribution could be scope over the wh-phrase.

5.2.3 Against a functional/pair-list ambiguity

We noted above the existence of two types of non-independent response types: provision of a schematic rule by means of what we have argued to be a function denoting NP, and a pair-list response. And, there is, in principle, nothing that prohibits a combination of these two options:

(447) Who does every graduate student admire most and who do John and Mary ?
The syntacticians admire their adviser, the semanticists admire Jespersen, John admires Billy Hatcher and Mary admires Di Feinstein.

A number of researchers (e.g. Groenendijk and Stokhof 1984, Engdahl 1988.) have argued that the distinction in response type is a consequence of a semantic ambiguity. In this section we respond to these arguments, specifically against the need for a pair-list option.[4]

The ambiguity theorists do not deny that, at least in certain contexts, which of the two response patterns gets used depends on essentially pragmatic features. The relational response is briefer, more succinct, and is better suited for generic and nomic statements.[5] The pair-list response can be more (pragmatically) specific, and will tend to be used when the domain of the characterising function is salient and small. So what appears to be a pair-list reading could, claim the ambiguity theorists, actually be a relational one, presented in pair-list fashion. This would be a way out of example (447).

The ambiguity theorists have been intent on showing that the use responsible for eliciting 'functional' responses cannot be reduced to the 'pair list' use, in which putatively some element has scope over the interrogative quantifier. This we clearly endorse. The converse issue is: are there any arguments that force one into the reverse position, namely that the 'pair-list' use is not a special case of the 'functional' use'?

[4]Chierchia 1991 has, independently, argued for a similar conclusion based principally on the undesirability of WHQI, on the similarity in syntactic constraints on these uses and on the fact that pair-lists are also means of specifying functions.

[5]Though its occurrence in every-day discourse is, impressionistically, quite infrequent.

Argument from distribution

The first argument made for the ambiguity is distributional: it is claimed that there are interrogative sentences that can be used in a way that elicits functional, but not pair-list responses. The classic case being sentences of the following type

(448) What bone did no dog chew ?

In fact, the claim is that among quantifiers the universal quantifiers are the only quantifiers that permit a 'pair-list' use. It is not easy to test this generalisation because there are strong, *pragmatic* factors working in its favour. as we shall see below, where we try to control for them.

We first discuss why (448) is thoroughly resistant to a pair-list response on a dependent reading.

A schematic content for it is:

(449) ⟨ λh ⟨ NO, DOG(x), λ x ⟨ CHEWED, chewer:x,
chewed-object:y, bone y ⟩ ⟩ ⟩

Any function sought is one, call it f_0, constrained to make the property DOG(x) disjoint from λ x ⟨ CHEWED,chewer:x, chewed-object:y, bone y ⟩. A pair-list response in this case provides pairs of chewers and bones, where the chewers *cannot* satisfy the property DOG(x). In other words, it provides no direct information whatever about dogs and their chewing tendencies. If, for instance, this question were asked by someone wishing to avoid giving the wrong bone to a dog, a pair-list response would not help in the least, since the chewing tendencies of non-dogs are quite irrelevant. The general point is, then, that specifying a function simply by means of its graph underdetermines its character.

A response that provides a canonical function can be, however, very informative in such cases: thus responding 'the bone he buried last year' in this case provides positive information concerning dogs and their preferences for bones. namely that last year's bones are universally not chewable.

It is widely believed that only the universal quantifier can allow for 'pair-list' responses.[6] A rough examination of the data appears to confirm this view:

(450) a. Which man does no woman love?

b. Which book did most authors write last summer?

Thus the most natural reading of (a) inquires after 'the universally hated man', and does not lend itself very easily to a listing of women-hated men. Similarly, (b) appears somewhat bizarre, suggesting perhaps a multi-collaboration between authors.

However, the generalisation in question, namely the unavailability of 'pair-list' responses with quantifiers other than the universal is attributable to interference of two pragmatic factors, both of which favour universal quantifiers. Once these factors are controlled for, the possibilities for various other quantifiers improve.

First, as Groenendijk and Stokhof themselves point out, when a pair-list response is provided, the responder needs to single out a witness set which is a member of that quantifier and then specify the relationship of its individual members to objects of the queried type. So, for 'Where have at least 3 former students gone since graduation', one has to locate a set which is in the quantifier set 'at least 3 former students' and provide for each member of that set the location of the job found by that member. With 'every X', this is a natural enough thing to do, since there is a natural candidate for the witness set, namely the set of all X's, on which the quantifier 'lives', that is is the least member of the quantifier set, ordered by inclusion. Other quantifiers do not live on a unique set, and it is therefore unclear which witness set to single out, if any.

A second factor arises from considerations of informativeness/manner: it is usually somewhat strange to use a question containing a non-universal quantifier intending to elicit a 'pair list' response, when one could be using the corresponding question that contains a universal quantifier.

(451) a. Which book did each author write this summer?

[6]See e.g. Groenendijk and Stokhof 1984, Chapter 3.

b. Which book did most authors write this summer?

If one is interested in the sort of detailed information provided by a pair-list response, why would one be satisfied by a specification which covers only a witness set in 'most authors', but not in 'every author'? Unless contextual information is provided which explicitly accounts for this somewhat improbable state of affairs, pragmatic reasoning would suggest that use of (451b) must correlate with an individual reading, since if a pair list reading were intended, (451a) would be a likelier way of asking this.

Thus, a context which will readily admit of a 'pair-list' response for a question containing a non-universal quantifier must satisfy at least two conditions:

- There must be indications that the choice of witness set is reasonably arbitrary.
- It should be clear why it suffices to provide a non-universal listing of pairs.

Some examples follow in which these factors have been controlled for. Impressionistic polling with a number of informants suggest the pair-list responses are possible, though not preferred:

(452) a. Q: (Since you haven't as yet had the opportunity to complete your research about all the authors, all I ask is that you tell me) which book did most of the authors you met really enjoy writing.

A: OK, well: Norman Mailer really enjoyed writing The Executioner's Song, Saul Bellow enjoyed writing Sammler's Planet,...

b. Q: Our academic assistant, Bill, could probably tell you how our former students have been getting on. (Gestures to Bill:) Where have some of our former students moved to since graduation ?

A: A rough sample: Beth Browning has gone to Umass, Gerry Hopkins has gone to Brandeis, Siggy Sasson has gone to MIT,...

c. Q: Most people here like someone. Oh yeah, who?

A: Bill likes Mary, Sue likes Sam,...

The cognitive argument

The second argument derives from considerations of cognitive fine grain. Consider the question

(453) Which politician does Bill know every sane Canadian admires ?

Bill, the argument goes, can know a relational description of admiration tendencies among sane Canadians, without knowing a pair by pair description, and vice versa.

The first point to note with respect to this argument is that if it is at all convincing, it defeats the first, distributional argument. After all, this same psychological argument can be used with respect to both examples in (454):

(454) a. Which politician does Bill know most sane Canadians admire?

b. Which politician does Bill know exactly thirteen sane Canadians admire?

where the 'pair-list' construal is supposed not to exist: clearly, Bill can have a pair-list knowledge of the political admirations of a set of sane Canadians from 'most sane Canadians' or from 'exactly thirteen sane Canadians' without knowing a relational description, and vice versa. If these different psychological states are to be distinguished on the basis of the 'relational' v. 'pair-list' distinction, the ambiguity theorists cannot distinguish these states, for an unbounded set of quantificational statements.

What of the substance of this argument? It is worth noting that these cases bear a suspicious resemblence to different ways of construing quantification, that is, substitutional and objectual:

(455) Bill knows that every sand grain is made of quartz, because (a) He took Chem 001 last quarter, or (b) he has been to every beach in the world with his mass spectrometer.

Now while it is fairly well accepted that quantified statements should be construed objectually, this does not mean that at times one might not report an agent's knowledge (or some other attitude) towards a quantified statement based on, as it were,

'substitutional representation' by the agent. This does not mean that (a) needs to be regarded as arising from a different reading than (b). A similar moral would appear to apply to the interrogative cases.

The crux of the matter, we claim, is that functions can be presented in at least two general ways. The first is by a schematic, general rule, as captured paradigmatically by a simple lambda calculus abstract. The second, is by the function's graph, which lists for each domain value, a corresponding range value. In Calculus, these two ways are often combined. Insofar as identifying a given function, both ways are formally equivalent, even though, of course as far as *form* goes, they differ. Translated into linguistic terms, these differences cannot be appealed to as far as semantics goes, though clearly they have pragmatic ramifications.

5.3 Multiple questions arise by quantifying in

5.3.1 Introduction

We move now to consider multiple wh-sentences, the second general area assumed to provide motivation for the quantificational nature of wh-phrases.

(456) a. Which cellist likes which piece?

b. Jacqueline du Pre liked the Elgar, Harel the Mendelsohn sonata,...

In this category one can include works such as Karttunen 1977, Karttunen and Peters 1980, Higginbotham and May 1981, Groenendijk and Stokhof 1984, 1989 May 1985 and Engdahl 1980, 1986. The assumption of these accounts is that sentences such as

(457) What cellist likes what piece?

arises by quantifying 'what cellist' via their 'quantifying into wh' (WHQI) rule into an interrogative content with scope over 'what piece'. Schematically:

(458) What cellist$_x$ (What piece$_y$ (x likes y))

The assumption common to these approaches is that such sentences are to be assigned meanings identical to other interrogative sentences resulting from quantifying into wh:[7]

(459) What piece does each cellist like?

The motivation for this assumption is the fact that both classes of sentences manifest uses which can elicit pair-list responses. We demonstrate that this assumption is false: we provide various instances of contexts where the responses elicited diverge. Perhaps the most conclusive problem for quantificational approaches comes from interrogative Bach-Peters sentences: quantificational approaches cannot generate crossed readings using their quantifying into wh rule. However the problem is much more intrinsic. Even if means are posited to get around this problem, the data shows a basic asymmetry in the availability of crossed readings in multiple-wh Bach Peters sentences and mixed quantifier/interrogative Bach Peters sentences. This will suggest that no unified treatment can both treat interrogatives as quantifiers and provide an account of the asymmetries.

The intuition that sentences such as (459) and (457) do have a use in which their contents are similar is a valid one. Nonetheless, just as we have provided various arguments against quantifying in as the source of pair-list readings in unary wh-sentences, we will argue against assuming this to be the source of such readings in multiple wh-sentences, the conclusion being that the source of the common use is a dependent use.

5.3.2 Disjunction resolution contexts

The first case we consider are 'disjunction resolution' contexts, contexts in which disjunctive information is salient. Multiple wh-sentences used in such contexts do not elicit pair-list responses. That this is not simply a pragmatic fact is indicated by the fact that in the same contexts unary wh-questions containing quantifiers are preferably responded to with pair-list (or functional) responses.

[7]This does not apply to Engdahl, who does not correlate pair-list readings in unary wh-questions with quantifying in. Engdahl does quantify into wh to get multiple wh-questions.

(460) a. (Context: It is known that Cal phoned Ann or Ann phoned Cal.) Who phoned whom?

b. (Same context:) Who did each person phone?

(461) a. Well, it's Cal who phoned Ann.

b. Cal phoned Ann, while Ann phoned Zhang.

In the context provided in (460), the response provided in (461a) would be the natural one. On the other hand, in the same context, the preferred response to (460b) is still (461b).

Indirectly, this last utterance could be taken to resolve the disjunction, by implicating, for instance, that 'Fu is *not* chasing Li.' But that is fundamentally different information than the sparser information that (461a) conveys as a felicitous response to (460a).

5.3.3 Bach Peters sentences

In section (4.2.5) we provided extensive data concerning interrogative versions of Bach-Peters sentences. This can be summarised as follows:

- Crossed readings in multiple-which sentences are available and do not elicit pair-list responses. The possibilities of a pair-list response are *not* improved substantially if the pronominal dependency present on the object interrogative is removed.

- In quantifier/interrogative Bach-Peters sentences, a crossed dependency reading is unavailable. On the other hand, if the pronominal dependency present on the interrogative is removed, a pair-list response becomes available.

This data seems to be incompatible with the view that interrogative phrases are quantifiers in a sense analogous to nominal quantifiers. Quantificational approaches to wh-phrase meaning cannot generate a crossed scope reading for such a sentence using their WHQI rule if it is assumed that both anaphora are bound variable: the

variable corresponding to the narrowly scoped quantifier must remain unbound in the restrictive term of the wider scoping quantifier.

However, if one assumes that quantifiers do not scope each other strictly at a level of logical form (Higginbotham and May 1981, May 1985), or alternatively that one of the anaphora is generated by E-type anaphora, the essential asymmetry requires differentiating the scoping mechanisms of the two expression types.

5.3.4 Multiple reprises

Multiple-wh-sentences used to reprise can elicit both non-pair-list and pair-list responses.

(462) a. You gave WHAT to WHOM?

b. I gave the Xylophon to Maxine (and the tambourine to Toni).

(463) a. You're being unclear: WHOSE coat was found by WHO?

b. Billie's coat was found by Max, the guy over there.

5.3.5 Uniqueness relativisation

The intuition that sentences such as (459) and (457) do have a use in which their contents are similar is, we believe, a valid one: the data we have seen, nonetheless, indicates strongly that quantifying in either a nominal quantifier or an interrogative phrase into an interrogative content is not the source for this commonality. In the former case, we have argued, informally so far, that a dependent uses of an interrogative phrase can be held responsible for pair-list and functional responses. The natural conclusion to draw is that similar considerations apply to multiple wh-sentences. The data we have seen above suggests strongly that multiple wh-sentences are ambiguous between a use that does not require a pair-list response, and one in which a pair-list response is the natural way to respond. Let us consider in detail the strongest piece of evidence for this ambiguity, deriving from a puzzle concerning the uniqueness of 'which phrases'.

We noted in section (4.2.5) that 'which phrases' with a singular common-noun-phrase carry a uniqueness, though not existential presupposition in unary wh-sentences:

(464) a. Can you remind me please which Canadian athlete was suspended in 1988?

b. Ben Johnson.

c. Let's see, # Ben Johnson, Trevor Smith,...

(465) a. Can you remind me please who was suspended in 1988?

b. Let's see, Ben Johnson, Trevor Smith,...

However, in certain multiple 'which-sentences', as noted by Higginbotham and May 1981, the uniqueness can disappear, as long as the specification providing the answer is, roughly, 1-1: thus (466b) is a possible response to (466a).

(466) a. Which Canadian athlete won which competition in 1988 ?

b. Ben Johnson won the 100 meters, Debbie Brill won the high jump,...

This is a puzzle if we think of 'which phrases' as interrogative quantifiers carrying a uniqueness presupposition, since definite noun phrases, thought of as (non-interrogative) quantifiers carrying a uniqueness presupposition, maintain uniqueness when both are quantified in with sentence-wide scope:

(467) The woman with the big hat saw the girl with the polka dot dress.

Tinkering with the WHQI rule will not help because as we saw in multiple-wh-sentences with crossing dependencies, uniqueness *is* maintained:

(468) a. Which director who produced it backed out of which highly publicised movie that was causing him losses?

b. Coppola was the director, the movie was Hammett.

c. # Coppola (was the director) who backed out of Hammett, Ponti (was the director who) backed out of the bicycle thief,...

An account based on polyadic quantification, such as the 'absorption account' proposed by Higginbotham and May, also runs into problems. 'absorption' as defined by them creates polyadic quantifier expressions out of (pairs of) unary quantifier expressions. In order to block absorption from applying in cases such as crossed dependencies, absorption is stipulated to apply only when the subordinate quantifier expression does not contain a free variable bound by the first:

(469) [Q1 x:N(x)] [Q2 y:M(y)] → [Q1 x, Q2 y:N(x) ∧ M(y)]

As Engdahl 1986 has pointed out, this leads to incorrect predictions. Although, Higginbotham and May claim that (470) must have a unique reading, disallowing a pair-list, this seems not to be the case. Their own suggested infelicitous response is (470b). Judgements about this response vary, however Engdahl's example (470c) seems quite acceptable:

(470) a. Which boy likes which one of his sisters ?

b. John admires (his sister) Mary, Mike admires (his sister) Beth....

c. Bill likes his elder sister, Mike likes his younger sister,....

It is true, nonetheless, that the tendency to provide a pair-list response in such cases is weakened. We will suggest in section (6.5) that this is because the reading in these cases is a combined independent/dependent reading, where the uniqueness preupposition associated with one of the 'which' phrases is maintained. Hence, if a pair-list is provided, it represents an exhaustive response conveying pairs of entities and dependencies uniquely associated with them. Since, as we have argued in detail in chapter 1, exhaustiveness is a pragmatic need, the tendency to be exhaustive and provide a pair-list in such cases is weaker than it is when the pair-list serves to specify a dependency.

Examining additional examples appears to strengthen this conclusion:

(471) a. (What's the latest in Hollywood:) Which director is proud of which one of his most recent movies?

b. Coppola is proud of his latest movie. Let's see who else? Oh, Scorcese is proud of his least profitable movie,...

(472) a. (Tell us the latest, a rough night on the ice, huh?:) Which skater missed which one of her jumps?

b. Ito missed the first jump she tried. In addition, Harding missed the one she usually has problems with.

We will show how the account used to explain uniqueness relativisation in sentences like

(473) a. Every dog wagged his tail when he saw his master.

where the uniqueness presuppositions such pronouns, arguably, carry on deictic uses, become relativised in bound variable anaphora, extends both to dependent uses of other expressions such as 'local' in

(474) During superbowl weekend, every sports enthusiast frequented a local bar.

and to multiple wh-sentences such as

(475) Which director likes which movie.

5.3.6 Previous approaches to dependent uses

We have emphasised in previous sections the need to distinguish between at least three uses of wh-phrases, independent, dependent and reprise. Both Engdahl 1980, 1986 and Groenendijk and Stokhof 1984 are accounts that recognize the need to provide for the dependent/independent distinction, in their terms the relational (Engdahl) or functional (Groenendijk and Stokhof)/ individual uses. The main issue that accounts postulating the possibility of a dependent/relational/functional use must contend with is the *source* of this use. That is, is such a use characteristic solely of interrogative expressions, requiring the postulation of an ambiguity particular to interrogatives, or

can the principles governing this use be derived from more general considerations applying to other expressions?

In fact, both Engdahl and Groenendijk and Stokhof insightfully suggest more general settings for the accounts they propose. Groenendijk and Stokhof suggest that the skolemisation which their approach relies on has applications in sentences such as

(476) Every man likes a woman, namely his mother.

We believe this is an important insight, and is further confirmed by the data we provide concerning sluicing and anaphora with dependent uses. Engdahl, for her part, motivates her approach in part by similarities between (donkey) pronouns and interrogative phrases. Our own account generalises this insight further by arguing that interrogative phrases are one of an open class of expressions that can undergo *dependent* uses.

Groenendijk and Stokhof's account makes recourse to syntactic distinctions that are, by their own admission, problematic: they assume the existence of special *functional* null pronominal elements. Expressions containing such elements are then input to a function-pronominal particular WHQ rule that creates functional interrogative contents.

Beyond the generally problematic nature of the syntactic ambiguity posited, such an approach becomes the more problematic, the less plausibly such null elements can be postulated to exist in a given syntactic structure that allows for functional uses: in this case, sluicing and alternative phrases.

Engdahl does not make recourse to the syntax to disambiguate uses of interrogatives. Her system incorporates a phrase-linking grammar that incorporates a Cooper storage system for disambiguating scope. Interrogative phrases denote existential quantifiers over functional dependencies of all r-ities. Engdahl motivates allowing for dependencies higher than one by means of examples like:

(477) a. What does every man tell his children?

b. How much he sacrificed himself for them.

The dependencies are quantified in with widest scope by means of a WHQ rule. Schematically:

(478) ∃ Wh, Q1 x, Q2 y(P (... x, y, Wh() ...))

Independent uses arise when the dependency is 0-place. Dependent uses arise when the dependency is unary or higher. For instance:

(479) ∃ Wh, Q1 x, Q2 y(P (... x, y, Wh(x) ...))

Engdahl's system runs into the problems that were discussed above that all WHQ systems face: these are brought out in the inability to provide an account of the distribution of crossed scope readings for various types of interrogative Bach-Peters sentences. Consequently, an account of the uniqueness relativisation puzzle concerning 'which phrases' would appear to be unavailable.

5.4 Syntactic motivation for the quantifierhood of interrogatives

We have argued above against assuming interrogative phrases to be quantificational phrases. Our arguments have been exclusively semantic. We now move to consider syntactic considerations in this respect. Chomsky 1977, and various subsequent works, have argued for the existence of a syntactic level of *Logical Form* where wh-phrases have quantifier-like representations. The intent is to be able to explain various facts about the meanings of interrogative sentences on the basis of various general syntactic well-formedness principles. These concern primarily the scopal interactions of interrogative expressions with each other and with nominal quantifier expressions.

Conversely, assuming a highly transparent mapping to hold between this syntactic level and the level at which meanings are represented, there is assumed to be a pay-off in the ability to explain facts that hold at a level of surface syntactic level on the basis of principles that hold at LF. The hypothesised quantificational nature of wh-phrases is assumed to account for the putatively obligatory fronting of wh-phrases in

non-echo unary wh-sentences in English. This is sometimes phrased as 'Wh-fronting is triggered for purposes of scope assignment.'

We consider the validity of these assumptions and a number of the explanations that they have spawned. First, we will suggest that linking the way a wh-phrase makes its semantic contribution with fronting is problematic, not least because the assumption that wh-fronting is obligatory in unary wh-sentences in English appears to be incorrect. We then consider an intermediate position, namely that some wh-phrases must be fronted for interpretation, while others not. We will argue that the motivation for this assumption is questionable. We then move to consider a proposal based on the existence of LF intended to explain the subject/object asymmetries characteristic of dependent uses. We defer to chapter 7 discussion of one proposed motivation for LF based on data from embedded interrogatives in Mandarin Chinese. In that chapter, we demonstrate the the argument that LF is required or privileged in the explanation it provides for the phenomenon does not go through.

5.4.1 Correlating syntactic movement with the interpretation of interrogatives

An important motivation in assuming wh-phrases to be syntactic quantifiers is the assumption that this can provide an account for the data that suggests that wh-fronting in unary wh-interrogative sentences in English is a necessary condition for a use of such sentence to make 'information queries'. In other words, all non-fronted unary wh-interrogative sentences can only be used to make reprise queries. The problematic nature of this general strategy comes from two assumptions: on the one hand, the assumption that reprise uses involve some intrinsically different *interrogative* meaning, or different interrogative expressions for that matter. Conversely, the assumption that non-fronted unary wh-interrogative sentences can only be used to make reprises. Both assumptions are false, as we demonstrated in sections 4 and 5. We recapitulate here some of the data that indicates this.

Reprise uses

The assumption that reprise uses involve some intrinsically different *interrogative* meaning was challenged in section (4.4). Thus, reprise uses of unary wh-interrogative sentences with non-fronted wh-phrases can be paraphrased, subject to syntactic constraints, with non-reprise uses of fronted wh-interrogative sentences:

(480)

You like WHO?

Who did you say (just now) you like?

(481) a. (Go home Billy!) Go WHERE?

b. Where did you order me (just now) to go?

(482) a. Who likes WHAT?

b. ? What did you ask me (just now) who likes? [Violation of wh-island]

Similarly, reprise uses can be reported by embedding an interrogative under *ask*, just like other queries:

(483)

Jill:You like WHO?

Jill was amazed at what I told her, so she asked me who it was I had said I liked.

(484) a. (Go home Billy!) Go WHERE?

b. Bill couldn't believe his ears, and asked, utterly incredulously, where I had ordered him to go to.

We showed there that the same characterisation that could be given to reprise uses of declaratives could be transferred to interrogatives: If a reprise use of a declarative S in a context c_0 is characterised by the fact that the 'normal' descriptive content of S is relativised to the illocutionary force of the previous utterance, then a reprise use of an interrogative S is characterised identically, save for the fact that one or more of the argument roles of the original content are left unresolved. In other words, exactly the same *interrogative* semantic contribution of the interrogative occurs as in independent uses where 'information queries' are made. Thus, the descriptive content of a reprise use of an interrogative sentence is an unresolved SOA just like any other interrogative content, which is then input to the standard illocutionary query operator, whose features and responsehood characteristics were discussed in chapter 1.

(485) a. QUERY(q_0), where q_0 is the descriptive content of the reprise use.

b. 'Please provide a response r that satisfies Response(r,q_0)'

Non-reprise uses of unfronted wh-phrase interrogative sentences

We provided evidence in section (4.5) that, in appropriate contextual conditions, characterised roughly as 'supporting an existential presupposition for the question', unfronted wh-phrase interrogative sentences could be used to make non-reprise uses:

(486) (Alicia pokes head in office occupied by Belinda, who is commonly known to be leaving the area shortly:) Say, Belinda, you're leaving when exactly?

(487) (Denis pokes head in office occupied by Alicia. The two have previously committed to a joint activity of unspecified nature the following day:)

Denis: We're going out tomorrow, right?

Alicia: I guess so. And we're going to do what exactly?

It is quite evident in all these cases the second speaker has heard and fully understood the first speaker's utterance. On the basis of the information that it provides,

she proceeds to query for specific information, in other words, making an independent use of the wh-phrase. These can *not* be analysed as reprise uses. A paraphrase in (488), argued for in section (4.4), is not applicable for the above uses:

(488) a. When did you say you were leaving?

b. What did you say we're going to do exactly?

We suggested that the existence of sluicing serves to restrict the use of such forms: there exists a form that is briefer and more specific, namely a sluice, that can be used in any such biassed context:

(489) a. A: I met someone in the office today.

b. You met who in the office today?

c. Who (is the person you met in the office today)?

(490) a. Bill told me that Mike claimed he found something in his office today.

b. (Bill told you that) Mike claimed that he found what in his office today?

c. What (is the thing that Bill told you that Mike claimed that he found in his office today)?

However, given that reprise uses of sluicing get resolved to yield a content identical to the 'reconstructed' content, the only advantage sluicing has is brevity, whereas since in such cases, it is often unclear which argument role is serving as the antecedent argument role, the longer form is less liable to be ambiguous:

(491) I saw Sally Chu and Millie VanNess at the theatre tonight.

WHO?

You saw WHO and Millie VanNess at the theatre tonight?

You saw Sally Chu and WHO at the theatre tonight?

You saw WHO at the theatre tonight?

Unfronted unary wh-interrogative sentences and movement at LF

Nothing in the data we have considered above rules out the possibility that the unfronted wh-phrases are fronted at LF. This seems an unpromising line to adopt, however. Given that the *in situ* syntactic position of the unfronted wh-phrases is in various cases a position from which fronting is illicit, assuming that unary *in situ* wh-phrases are fronted at LF means accepting that various interrogative forms that are ill-formed as surface representations, most plausibly because they violate constraints on movement/unbounded dependency,*are* well formed at LF. Hence emptying much of the motivation for viewing LF as a syntactic level of representation.

5.4.2 D-linking

Since English lacks multiple fronting, multiple wh-sentences involve at least one non-fronted wh-phrase on the surface. Asymmetries in acceptability of fronting in multiple wh-sentences have been claimed to be explicable from certain syntactic well-formedness constraints on movement at LF (see e.g. Chomsky 1981)

(492) a. Who likes what?

b. [Requires biassed context/can be used to make a reprise:] What does who like?

(493) a. Who left a book when?

b. [Requires biassed context/can be used to make a reprise:] When did who leave a book?

The (b) sentences above were assumed to be ill-formed, or at best usable to echo. However, it is clear they can be used to make reprises or used *independently* in a biassed context. This point was first demonstrated in detail by Bolinger 1978 who showed that many, perhaps all, these asymmetries could, under certain contextual conditions, be defused. In fact, some of the asymmetries do not seem even to arise when a different wh-phrase is used associated with the same argument roles:

(494) a. Which boy likes which girl?

b. Which boy does which girl like?

In line with these latter facts, Pesetsky 1987 proposed a 'compromise' approach. Some interrogative phrases are quantificational and require fronting at LF for their interpretation, others are interpreted like indefinites and do not require fronting at LF. These latter expressions require, according to Pesetsky's proposal, 'D-linking', their use requires a set of possible instantiators for the argument role with which the D-linked expression is associated to be salient. The prototypical D-linked interrogative expressions are 'which' phrases. Pesetsky concluded that the Chomskyan account for the asymmetries above can be maintained, albeit restricted to the quantificational interrogative phrases. Moreover, according to Pesetsky, his account provides additional motivation for the existence of LF, where the differences between the quantificational and the non-quantificational wh-phrases are brought to bear.

We concur with Pesetsky in two points: on the one hand 'which phrases' have a characteristic that separates them from expressions such as 'who' or 'what'. We argued in section (4.2.5) that 'which phrases' carry a uniqueness presupposition of a particular kind, which we reiterate below. 'who' and 'what' do not carry such a presupposition. On the other hand, we have argued in some detail in previous sections against assuming that interrogative phrases, including 'which phrases', are quantificational. Where we disagree with Pesetsky is in his assumption that 'which phrases', or any other inherently D-linked expressions, make use of an intrinsically different interpretational mechanism from that used by 'who' or 'what'. In other words, we claim that Pesetsky's assumption that D-linking (or some similar property) has anything to do with the interpretational mechanism of interrogatives is unsupported and problematic.

The initial and most obvious problem for positing a bifurcation is noted by Pesetsky himself: the putatively quantificational interrogatives *can*, in appropriate contexts, license superiority violations. This means that in order to maintain the account, one has to assume that such phrases are ambiguous between a D-linkable and a non-D-linkable expression. So the contextualisable superiority violating form results from

a use of the D-linked not the quantified versions of 'who' and 'what'.

If indeed a bifurcation exists, one would plausibly expect to find that one type of interrogative expression has a class of uses that differ from the other type of interrogative expression. However, this expectation is not met: 'which phrases' and 'who' can be used independently, dependently and to reprise:

(495) a. Who does every Englishman admire most?

b. Mary Queen of Scots.

c. His mother.

d. WHO does every Englishman admire most?

(496) a. Which person does every Englishman admire most?

b. Mary Queen of Scots.

c. His mother.

d. WHICH PERSON does every Englishman admire most?

In fact, saying that an expression requires D-linking for felicitous use amounts to imposing a presupposition on that expression, in other words, it amounts to restricting the use of that expression to certain contexts characterised by certain conditions. We have noted, with Bolinger and Pesetsky, that 'who' or 'what', in appropriate contexts, license superiority violations. If we say that 'Which phrases' are D-linked and therefore license superiority violations, all this amounts to is saying that in appropriate contexts, those contexts that satisfy the D-linking condition, interrogative forms containing a 'which phrase' and that violate superiority, can be used. That is, the generalisation that forms containing 'which' apparently license the violations with greater ease than those forms containing 'who' or 'what' is illusory since the contexts in which 'which phrases' can be used are a strict subclass of the contexts in which non-inherently D-linked expressions can be used.

In fact, the condition which Pesetsky suggests characterises felicitous uses of 'which phrases' is incorrect. Pesetsky suggests that a use of a sentence like 'Which

book did you read', 'the range of felicitous answers is limited by a set of books both speaker and hearer have in mind.'

We suggest that 'which' carries with it a uniqueness presupposition like the definite determiner 'the': This places an obligation on the speaker: even if she does not *know* that an entity satisfying the *queried* property exists, she must know of a situation in which a unique entity satisfying the *restrictive* condition exists, and she *strongly suspects* that it, whatever or whoever it is, does satisfy the *queried* property. This does not restrict the set of possible *answers* that can be conveyed to 'salient entities'. In fact, it is quite possible that no entities instantiate the *queried* property, or that the querier or responder think so or intend to convey that:

(497) a. Which car, if any, do you intend to buy when you get a raise?

b. Actually, as you hinted, at present there's no car I really intend to buy.

(498) I don't know anything about cars. Do you have any suggestions about which car, if any, I should buy when I get a raise?

It is implausible to suggest that in using a sentence such as (498) the speaker has a range of felicitous answers in mind, let alone a range of felicitous instantiators of the *buyee* argument role. Admittedly, a D-linking condition is frequently going to be associated with the use of a 'which phrase', since if the set of possible instantiators is salient, the speaker is more likely to rest assured that the uniqueness presupposition concerning the descriptive condition is satisfied.

In fact, it is not the case that D-linking characterises sentences containing 'which phrases' or superiority-violating multiple wh-sentences. Even certain fronted unary wh-interrogative sentences require D-linking: the need for D-linking derives in many cases from the needs of *domain anchoring.* These needs are particularly specific for 'which phrases', namely, a domain satisfying unique instantiation of the descriptive condition, but this is merely a matter of degree.

Any use of a sentence requires the fixing of a domain or situation which the utterance concerns. Without this, the utterance is not felicitous. Thus, unquestionably, out of the blue, an utterance of a sentence like

(499) Who likes whom?

contains no semantic clues to the domain over which the possible fillers of the parametrised roles originate. Hence, without further contextual specification of the domain, the query will be infelicitous. But the fact that this takes place with multiple-wh-questions is quite orthogonal to their semantics. It applies equally to unary questions and even non-interrogative sentences.

(500) a. (Out of the blue) Who arrived? (implicates) Who around here arrived just now?

b. (Out of the blue) Someone was shot. (implicates) Someone (in some salient situation) was shot recently.

Thus, a tendency to D-link, i.e. to anchor deictic parameters of a use of the sentence to contextually salient entities is a characteristic of any sentence that does not contain expressions explicitly required to refer or describe such parameters. Multiple wh-sentences show this tendency more than unary wh-sentences, since the latter usually contain more explicit clues to the concerned domain. Compare:

(501) a. Who likes John?

with

b. Who likes whom?

Any utterance of (501a) necessitates the performing of a referential act towards a person named 'John'. In so doing, at least some indication of the concerned domain is provided. This aspect is missing in (501b), hence the need to D-link. This need will of course be lessened, in sentences such as the following:

(502) a. Who among the people in this office likes which recently published books?

That something like D-linking is a factor in the licensing of the use of certain wh-sentences is clear, just as such conditions characterise the use of certain non-interrogative sentences, most obviously topicalisation:

(503) a. Those bagels, I like.

b. I like those bagels.

c. What do you like?

d. You like what?

Whether the declarative sentence in (503a) or the closely related sentence (503b) are used in a given context depends on the topic/focus structure of the discourse. Analogous, though not identical remarks apply to the two interrogative sentences (503c,d). Roughly, the former is more appropriate in a neutral context where no existential presuppositions are salient, whereas the latter is preferred in a biassed context.

A strong D-linking condition, in the sense that there is information that a certain set of salient individuals are known to instantiate the question, is just one way of enforcing an existential presupposition.

On the other hand, if the D-linking claimed to be a condition characterising *in situ* occurrences or uses of 'which' is taken in a strong sense, such that the possible instantiators have to be contextually salient (or able to be accommodated), then the condition is clearly false, as in Bolinger's example repeated here:

(504) a. (Post-maritally blissful speaker):We're going to buy a house.

(Skeptical in-law): Uh huh. And you're going to pay for it with what?

In (504), there is no stronger sense of salience for a set of candidate payments than in any existential quantification. Similar remarks apply to a set of possible results evoked in the following example:

(505) Mr Staples says that in a presumably more responsible past film makers changed names or added disclaimers to their productions. And the results were what?' (NY Times 10 Jan 1992)

Considerations pertaining to D-linking do not require stipulation of distinct interpretational mechanisms. In some cases they require associating specific presuppositions with certain interrogative phrases and structures. The putative distinction in semantic interpretation between inherently D-linked and quantificational interrogatives phrases is unsupported, and does not motivate the need for a level of LF.

5.4.3 ECP effects

May 1985 was the first to point out the existence of asymmetries in the availability of pair-list responses to sentences like the following:

(506) a. ?Which theorist proved every lemma?

b. Which lemma did every theorist prove?

May derived the asymmetries on the basis of (syntactic) well-formedness conditions on quantifier/wh scopings assumed to hold at LF. May used this to argue for the existence of LF, claiming that no semantic account could account for these facts. In fact, what May had in mind was a semantic account for such facts based on scopal ambiguities between an interrogative quantifier and a nominal quantifier. In this we endorse his conclusion, but note that this provides further evidence for a point we have made above, concerning the undesirability of assuming that *any* quantification into questions ever takes place.

May's account presupposes that the availability of a pair-list response (in our terms, dependent use) is correlated with movement of the wh-phrase, and indeed all quantificational expressions, at LF, via the rule of quantifier raising (QR). The success of an account like May's and consequently the motivation it provides for LF is dependent on being able to motivate LF movement for all cases where pair-list and, assuming our argument above against an ambiguity between the two response types, functional responses occur. We will argue that this is questionable.

We note first that the asymmetry, although clearly present, is not obviously of a type distinct from problems faced by scoping most quantifiers out of object position:

(507) a. Which theorist proved every lemma?

b. Which lemma did every theorist prove?

c. A theorist proved every lemma

d. Every lemma was proved by a theorist.

With appropriate contextualisation, the availability of the dependent use seems to improve:

(508) a. So, I'm writing up, I wonder if we could give proper accreditation. You tell me, and I'll write down as you proceed, which theorist proved every lemma.

b. OK: Gauss proved the snake lemma, Fermat proved the little theorem,...

With a quantifier like 'each theorist' the pair-list response is, in fact, preferred, as May himself acknowledges:

(509) a. Q: Which employee wrote each manual?

b. A: Bill wrote man1, Jill wrote man2,...

So, an ECP account requires that quantificational phrases headed by 'each' are exempt for some reason from the workings of the ECP. May claims 'each' is exempt because it has some focussing property.

We showed in section (4.2.7) that alternative-phrases manifest properties that can be accounted for by assuming them to have independent uses giving rise to a content identical to that of a wh-phrase used independently with a descriptive condition paraphrasable as 'an entity that is either (the referent) of alternative 1 or (the referent) of alternative 2'.

Alternative phrases can give rise to pair-list and functional responses:

(510) a. Does each person here have [Jill or Bill] as a role model?

b. Mike has Jill, Mary has Bill,...

c. Whichever one of the two has treated them nicer

(511) a. Does each person here want [tea or coffee]?

b. Mike wants tea, Melissa wants coffee,...

c. Tea for the linguists, coffee for the philosophers.

Significantly, the asymmetry is also present in alternative-interrogative sentences:

(512) a. Does each person here like [Bill or John]?

b. Does [Bill or John] like each person. (Pair-list or functional response highly dispreferred)

So, if the ECP based account is correct, it needs to be extended to alternative phrases, and LF movement is required to apply to them:

(513) a. Did Jill tell you that Mike knows whether [Bill or John] left this morning?

b. * Who did Jill tell you that Mike knows whether t left this morning?

As the example in (513b) shows, this type of movement/unbounded dependency will have to be postulated to obey different constraints from those applying to wh-phrases.

A further difficulty for the ECP account is its assumption that a pair-list response requires a (quantified) antecedent that scopes into the interrogative content. We have argued that this is problematic because pair-list responses can arise with plurals, for which there are good grounds to assume a non-quantificational analysis. More striking evidence is provided by the existence of pair-list and functional responses in sluicing, where there are similarly good grounds to believe that the interrogative contents lack constituents whose semantic contribution could scope over the wh-phrase.

In conclusion, we find that correlating dependent uses of interrogatives with LF movement of a quantificational antecedent, and the plausability of an account based on constraints on such movement is problematic.

5.4.4 Adverbs and LF

Berman 1990 has proposed an LF-based account of the asymmetries displayed by indefinites and interrogative phrases with respect to adverbial modification:

(514) a. Which regular customer rarely tips big?

b. A regular customer rarely tips big.

On Berman's account, both wh-phrases and indefinites denote variables. The motivation for this is that, according to Berman's analysis, both types of expression can in certain syntactic contexts display variable quantificational force. In chapter 7, we will argue against Berman's analysis of the facts that lead him to believe that wh-phrases can display variable quantificational force. The issue we concern ourselves with here is Berman's LF-based account of the adverbial asymmetry above:

Berman argues that the reason wh-phrases cannot be scoped by the adverb is that they move at LF to a position outside its scope. We will not enter into an appraisal of the account beyond noting that data provided in sections 2 and 4 are problematic for this type of explanation. Both alternative phrases and *in situ* wh-phrases manifest the same lack of adverbial scope interaction as fronted wh-phrases. Positing dislocation in both of these cases is problematic:

(515) a. You seldom used to go out with WHICH PERSON? (query has force: 'Which person did you say you seldom went out with.' wh-phrase does not get force of 'seldom'.)

b. Jill seldom used to go out with an attractive woman. (indefinite can be scoped by 'seldom'.)

(516) a. A quadratic equation usually has HOW MANY solutions? (query has force: 'How many solutions did you say a quadratic equation usually has?' wh-phrase does not get force of 'seldom'.)

b. A quadratic equation usually has two solutions.

(517) Does [John or Bill] regularly/seldom tip big?

5.5 On the need for context in the individuation of meaning

The data we saw in chapter 4 suggests that surface syntactic form underdetermines interrogative meaning in various respects. Moreover, we have seen in the previous section that attempts to provide syntactic structures that avoid this conclusion by postulating an abstract level of logical form run into significant problems: a level of logical form is of syntactic interest if it can provide forms that are simultaneously rich enough to disambiguate meaning and whose well-formedness is regulated by the same (or sufficiently many of the) principles that apply to surface forms (or other levels, in syntactic theories that posit them.) We recapitulate the data from interrogatives that suggests this conclusion and then indicate the nature of the account we propose to pursue.

The rejection of the performative hypothesis meant that illocutionary components of meaning were not assumed to have a necessary syntactic realisation. We provided evidence above that reprise uses of expressions in general and those of interrogatives in particular are governed by grammatical principles, in other words should be accommodated by the grammar. In order to determine the full *descriptive* content of any given reprise use, the illocutionary force of the utterance it reprises must be provided. This will frequently be recoverable only from the discourse context, unless one assumes the performative hypothesis.

However, it is not just illocutionary components of meaning that are underdetermined by the syntax: we showed that postulating syntactic movement at a post-surface level could not in general be taken to disambiguate the possible descriptive contents of a given surface interrogative form. Interrogative contents that give rise to pair-list and functional responses have been argued not to arise by quantifying into an interrogative content: this is indicated by the possibility of such responses with non-quantificational phrases, by the possibility of anaphora to either the function provided in a functional response or the pair-list, by pair-list/functional responses to sluices and by Engdahl's original cognitive argument. Hence, disambiguation of an independent from a dependent use cannot be based on a scopal ambiguity of the

interrogative phrase with some other expression.

Furthermore, appealing to the existence of some 'functional' trace is questionable, given that pair-list and functional responses can arise with alternative phrases and with sluicing. In both cases, most strikingly the latter, assuming a dislocation of the interrogative element at LF is highly problematic: the possibility of extra-linguistic control of sluices is one among a number of pieces of evidence suggesting that the elided element is, if it is syntactically realised at all, a (base generated) null element.

We also showed that attempting to capture various presuppositional features of interrogative sentences syntactically are either inadequate empirically or involve positing unmotivated ambiguities. Thus, a proposal to account for presuppositional ambiguities exhibited by surface interrogative forms by postulating a syntactic operation that can optionally create *polyadic* interrogative phrases overgenerates in one domain (Bach-Peters sentences) and undergenerates in the other domain it is intended to cover, the uniqueness presupposition relativisation of sentences containing multiple occurrences of *which* phrases. Similarly, an approach intended to capture presuppositional features of multiple wh-sentences ('superiority effects') by postulating two classes of interrogative expressions, regulated by different types of representation at logical form, must ultimately posit that the one class can optionally be interpreted by the mechanism posited for the other class.

For all these reasons, we do not make recourse to a level of logical form. LF's were originally introduced to provide a syntactic level where quantifier scope underdetermined by surface forms would get disambiguated prior to semantic interpretation. Cooper 1975 showed how one could avoid positing such a level by assuming the possibility of non-syntactically based ambiguity. Building on his insight, we will take the syntactic input to meaning to be a surface level which does not fully disambiguate meaning. This means that we rely on the context of use to fix various descriptive as well as illocutionary components of meaning. A given interrogative expression will be taken to be underdetermined in a number of important respects with respect to its semantic contribution: the context is assumed to disambiguate whether an independent use or a dependent use is being made, what the illocutionary force of a reprised utterance is, what the resolution of the missing predicator of a sluiced interrogative is.

at what level, embedded or matrix, an interrogative phrase is scoped in, and various other more general discourse parameters.

Syntactic form constrains, but does not determine various of these possibilities: for instance, in a language like English, a fronted wh-phrase will, with one class of exceptions, be obligatorily scoped at its surface syntactic scope position, an interrogative phrase will not be usable *dependently* on the argument role associated with an expression which is, roughly, in a cross-over configuration with it and so forth. We proceed now to describe the conception of meaning we adopt and how context is supposed to fit in with it, before describing our syntactic and semantic assumptions.

Chapter 6

Meanings for Interrogatives

6.1 Meaning and how to describe it

In this section we discuss the conception of meaning underlying the current work. Our starting point is the 'meaning is use.' approach originating with Austin, Strawson, Grice and Searle among others. People use expressions to do things, the theorist tries to find natural equivalence classes of expression/effect pairs. Adopting this perspective entails that on some level context needs to be brought into the picture, even if all sentences could be analysed as 'eternal' in Quine's terms: any use of a sentence involves a speaker and various conditions which are required to enable the production of an utterance to go through (No guns pointed at the speaker's mouth etc.). Nonetheless if that were all context were needed to explain, it could be projected away from the meaning of particular expressions, since it could be viewed as an constant factor, that did not vary across uses of particular expressions.

That context also influences truth conditions was demonstrated conclusively by Kaplan. He showed the purely *logical* interest in paying attention to the fact that context can distinguish two notions of necessity: the fact that 'I am speaking now' only gets its content fixed at each occasion of utterance can explain why utterances of this sentence never express falsehoods as they get uttered, even though the (singular) propositions expressed are contingent.

The original Kaplan view utilised Montague's notion of a pragmatic index (Montague 1968), according to which a *context* is determined completely by a tuple of values specifying a finite, in fact predetermined set of discourse parameters. An expression's meaning has as it were a supra-contextual nature, hence Kaplan's term *character*, and a *content* fixed once the discourse parameters are fixed. This conception faces problems in view of the restricted role it assigns to context, but, that notwithstanding, provides the basis for the conception we adopt. Very tentatively: the meaning of an expression is a mapping from contexts in which it can be used to (some characterisation of) objects that the use introduces.

That an index-based view of context quite soon runs into problems was noticed among others by Cresswell who pointed that the set of factors needed to fix the deixis of 'this' has no clear bounds. Barwise and Perry's idea was, roughly, that contexts are portions of the world 'surrounding' though not limited to the portion in which the utterance takes place. By making this move one gains the advantages possessed by having the entire world as context, while retaining the possibility of using context as an explanatory concept: there are many different situations, partial aspects of the world, for language users to exploit, not just the big whole world. But making such a move does not in and of itself constitute real progress as long as one does not have the means to characterise situations from *below*, bottom up, as actually *small* or sparse entities, rather than relying on some kind of combinatorial operation on worlds. Barwise and Perry's ultimate insight, it would seem, lies not in the choice of *parts* of the world as contexts, but rather in showing how such parts, situations, can be characterised bit by bit, by the facts that hold in them: exploiting context can be characterised in 'processing' terms as making use of the constituents of the facts which are required to hold in it.

In the Barwise and Perry approach, then, what the context 'contains' derives entirely from what is built in, when nothing is specified, the contextual parameter has no effect. Somewhat more precisely, Barwise and Perry model context by assuming the existence of additional independent variables in meaning, corresponding to discourse and other 'resource' situations. What are the extents of these situations? Exactly the facts which they support. Hence, in order to specify that a context contains specific

information, the facts by which this information is characterised have to be built into the situations. If no facts are specified as *supported by* the context, then the context has no effect on meaning.

A context is assumed to consist of two complementary aspects: it provides conditions required for the (conventional) effect of the utterance to go through ('presuppositional content'), as well as serving as a source ('oracle') for values not fixed by the expression itself. Saying that a component of meaning is 'context dependent' is to say two complementary things: on the one hand, that there is no rule determining solely on the basis of the given expression what value it contributes. On the other hand, that there is a rule requiring that this value get fixed somehow. That is, an aspect of meaning is context-dependent if the expression provides hooks without the objects that need to be hung upon them.

Consider a quantifier expression such as *every dog*. We know *a priori* what quantificational force such an expression contributes, basically *inclusion* or *sub-attributehood*. On the other hand, there is no rule which tells us, independently of a particular use, what domain it varies over. And yet, in order to get to the content of a use of such an expression, this value must be fixed *somehow* at any occasion of use. Notice that if one is to say that a *situation* needs to be provided as a domain in order to get to a content, and one writes that into a rule, one does not commit oneself to the position that on any particular occasion there is a conventional way or rule of *picking out* that situation. All one is committed to is that without providing a value for this parameter, the conventional effect cannot go through. Thus, while the speaker must have some way of fixing the contextual parameters, when he makes a speech act, it should be clear that an addressee need not have the means to fix all the parameters, or, alternatively to fix them as per the speaker's intentions.

The use of having a highly parametrised 'character'-like object around is that it allows for explanation of aspects of comprehension, partial or complete, that are quite independent of the particular contents they determine. To put it slightly differently, meaning becomes much less a matter of what the particular *denotation* of a (use of an) expression is, much more *how that denotation is determined.*

6.2 A compositional framework for describing meaning

6.2.1 Meaning descriptions

Basics

We now move to describe the framework utilized here to describe meanings of simplex expressions and how, when syntactically combined, the complex expression gets assigned a meaning that is a function of the meanings of its constituents. We use the situation semantics framework of Gawron and Peters 1990a, which draws on previous work in situation semantics, most notably Barwise and Perry 1983, as well as incorporating insights from Montague 1970, Kamp 1981 and Heim 1982.

A meaning of an expression according to the conception sketched in the previous section relates, or maps, contexts onto *presented entities.* We will assume a functional, rather than a relational view: it seems that the relational perspective is needed particularly if one wishes to be explicit about illocutionary effects, but less so if one restricts oneself to descriptive content. In the current presentation, we concern ourselves, for the most part, with the latter. Characterising reprise uses of expressions will be the sole case where we make explicit reference to illocutionary meaning.

What type of entity will be presented by a use depends of course on the expression: a declarative sentence can be used to present a proposition or, in our terms, a resolved SOA, which can be input to an assertion operation or various other illocutionary forces. A (QI) use of an interrogative sentence will, according to the analysis of chapter 1, provide an unresolved SOA, which is the appropriate object for a query operator.[1] In the case of singular NP's used referentially or indexicals the presented entity will be the referent. A use of a verb presents a relation, which is taken here as a primitive rather than reductively as a set etc.

A context for the use of any given expression, in line with our discussion above, are all the entities needed to determine the presented entity. In addition to a discourse

[1] We defer provision of an account of RI uses to chapter 7.

situation, these entities will include referents of deictic expressions and other situations, used as *resources*, roughly to do the work a 'domain' does traditionally for such expressions as quantifiers, or to ground various conditions such as presuppositions or anaphoric relations.

We now discuss the meanings of various kinds of expressions, syntactically simplex and complex. In what follows I ignore tense completely, and treat verbs, both transitive and intransitive, as expressions whose content is determined entirely independently of context. I also ignore all issues of illocutionary force, hence all the contents provided for now will pertain solely to the descriptive component. For expository simplicity, in the current section we use a simple context-free rules to present the syntactic expressions that are input to meaning. This will be amended in the section following the current one where state the syntactic assumptions our account depends on and adopt a particular syntactic framework over which meanings will be defined.

A simple example

Consider first the following sentence:

(518) I walk.

Any use of this sentence in an utterance situation $dis - sit_0$ by a speaker s presents the following object as its content:

(519) ⟨ **WALK, walk-er:** s ⟩

This suggests that the meaning of this sentence is the following: the presented entity or content of any use of the sentence is a function of the discourse situation, which is required to fix the identity of the speaker. We can notate this as follows:

(520) ['I walk']($dis - sit_0$) =⟨ **WALK,** s ⟩, where s is the speaker of $dis - sit_0$.

Note how context, in this case the discourse situation, comes into the picture: a discourse situation is assumed to provide a speaker. Why? In this case the answer

is simple: it is supposed to be one of the defining characteristics of a situation if it is to serve as a discourse situation. But this hides a more general point: whatever characteristics are needed from a context, can be built in as 'presuppositions' or conditions that need to hold, since a situation is (characterised) by the facts that are supposed to hold in it.

Thus, using situation theory, we might reformulate (520 as follows:

(521) ['I walk']($dis - sit_0$) =⟨ **WALK**, s ⟩.
CONDITIONS-ON-VALUE: $dis - sit \models$ ⟨ UTTERING, 'I', s ⟩.

Here the value of the function is partially described by the expression following the '=' sign. The SOA in the condition provides the remaining conditions that characterize the output of the function, in this case, that the entity s be identified with the speaker in the discourse situation.

It's worthwhile being clear at the outset what a 'formula' like (521) is: it is a specification for a function. It would make no difference were we to change the particular method of specification as long as it ends up picking out the same function. For instance, if we pick a different name for the expression we have denoted with 'I walk', say $I - walk_1$, and rephrase:

(522) The meaning of $I - walk_1$ is the following function: given as argument a discourse situation $dis - sit_0$, it returns as output the SOA
⟨ **WALK**, s ⟩, where s is the speaker of $dis - sit_0$.

Alternatively, if depict the SOA whose main relation is 'WALK' and walker role is assigned the entity x with 'WALK(x)', we might specify the function as follows:

(523) The meaning of 'I walk' is this: a function which takes as argument a discourse situation, $dis - sit_0$, and returns as output the SOA 'WALK(s)', where s is the entity speaking in $dis - sit_0$.

We belabour this point, but it is of some importance: it is useful to have a compact way of describing which particular function a given meaning is assumed to be, but how

this is done makes no difference.[2] In the sequel, we often use the resources of situation theory to describe the context: this is done by means of (depictions of) the facts that are required to obtain, both concerning the discourse situation and concerning the other contextual parameters. It should always be bourne in mind that English or some other language can, in principle, serve just as well. The sole advantage of using a formal description language is that it has a well defined semantics.

Let us introduce some terminology that will be useful in the sequel. Consider the following schematic description for the meaning of 'a'

(524) ['a'](x1,..,xn) = B.
CONDITIONS-ON-VALUE: C(x1,...,xn,B).

Metaphorically, 'B' provides the skeleton and 'C' the flesh, which combined make up the description. We call 'B' the *content-skeleton* of 'a': Skel-Cont('a'). 'C' we call the 'content-restrictions' on 'a': Restr-Cont('a'). Cutting up a meaning description in this way is of no theoretical significance, but does make for notational convenience.

Simple intransitive sentences

Let us consider a rather similar example, first providing the meaning of the whole sentence, and then constructing it from the meanings of its parts.

(525) You walk.

The meaning of the sentence is:

(526) ['You walk']($dis - sit_0$) =⟨ WALK, s ⟩.
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ ADDRESSED-WITH 'You', s ⟩.

Let us now try and get at this meaning compositionally. The syntactic structure of a sentence is, we shall assume:

(527) S → NP,VP

[2] That is, so long as we stick with the conception of context we outlined above.

As we have seen above, the entity any use of a sentence presents is a SOA. Not surprisingly, for sentences with no quantificational elements or tense, we take this to be simply the SOA whose main relation is the property presented by a use of a VP and whose sole argument is the entity presented by a use of the NP. So we can write the rule simply as follows:

(528) a. S → NP,VP

b. [S]($dis - sit_0$)= ⟨ Skel-Cont(VP),Skel-Cont(NP) ⟩;
CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP).

Let us see how we can use this rule to compositionally construct the meaning of the sentence in (525). The VP is very simple at present, since we're ignoring its internal structure, and assuming it is fully determined independently of context.

(529) a. VP → walk

b. ['walk']($dis - sit_0$) = WALK.
CONDITIONS-ON-VALUE: (none).

Moving to the contribution of the NP 'you'. It is fairly obvious to deduce the meaning of 'you':

(530) ['You']($dis - sit_0$) = s, where s is the addressee of $dis - sit_0$.

Or, situation theoretically:

(531) ['You']($dis - sit_0$) = s.
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ ADDRESSED-WITH 'You', s ⟩.

This rule is characteristic of the rules we write for singular NP's. The content-skeleton is a situation theoretic object called a *parameter*, associated with which are certain further conditions. Intuitively, this parameter can be thought of as a discourse marker introduced by any use of the NP. Although parameters, in contrast to

variables, are semantic rather than syntactic objects, the difference need not concern us. Hence, we will call the parameters in meaning descriptions *variables*, reserving the term 'parameter' for a specific subclass of these variables, roughly, those that remain free in the meaning description. We return to this issue shortly.

By inspection, we see that (531) and (529) combine to yield (532), as desired:

(532) ['You walk']($dis - sit_0$) = ⟨ WALK, s ⟩.
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ ADDRESSED-WITH 'You', s ⟩.

A transitive-verb sentence

In chapter 3, we motivated the need for an abstraction operation by means of which relations are derived from unresolved SOA's.

The VP rule we write is quite straightforward:

(533) a. VP → V,NP

b. [VP]($dis - sit_0$) = λx ⟨ Skel-Cont(V), subj-role:x,
obj-role: Skel-Cont(NP) ⟩;
CONDITIONS-ON-VALUE: Restr-Cont(V) conjoined with Restr-Cont(NP).

Let us see how this rule can produce a meaning for the following sentence:

(534) I see you.

(535) a. V → see

b. ['see']($dis - sit_0$) = SEE.
CONDITIONS-ON-VALUE: (none).

(536) a. NP → you;

b. ['You']($dis - sit_0$) = s.
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ ADDRESSED-WITH 'You', s ⟩.

A straightforward application of the VP rule yields:

(537) ['see you']($dis - sit_0$) = λx ⟨ SEE, subj-role:x,obj-role: s ⟩;
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ ADDRESSED-WITH 'You', s ⟩.

The meaning of 'I' was implicitly discussed above. It is:

(538) a. NP → I;

b. ['I']($dis - sit_0$) = t.
CONDITIONS-ON-VALUE: $disit_0$ |= ⟨ UTTERING, 'I', t ⟩.

Hence, the meaning of the whole sentence is:

(539) ['I see you']($dis - sit_0$) = ⟨ λx⟨ SEE, subj-role:x,obj-role: s ⟩, x: t ⟩;
CONDITIONS-ON-VALUE: t: $dis-sit_0$ |= ⟨ UTTERING, 'I', t ⟩; s: $dis-sit_0$ |=
⟨ ADDRESSED-WITH 'You', s ⟩.

Given that (539) already contains more than one variable in its meaning description, it is apposite to be somewhat more explicit about the issue in general: we use variables here as a means of either describing entities filling argument roles, or for placing restrictions on argument roles, which do not get assigned entities.

Whenever we write a meaning description, we assume a convention of using distinct variables for distinct expression constituents. In some cases, restrictions will appear that will force identity of value on distinct variables.

Where a variable is used to stand for an argument role *filler*, that variable is *a parameter of the meaning description*, that is, it signals that a value must be assigned to it in order that the content be determined. When this is the case, a condition linking that variable to a (sub)-utterance will be included in the meaning description, for instance:

(540) a. ⟨ UTTERING, 'I',t ⟩

b. ⟨ NAMED, 'Jill',t ⟩

When a variable is introduced which is not a parameter of meaning, this means that it is being used to describe restrictions on what entities can fill the argument

role with which it is associated. For this reason we group together all restrictions introduced on a given role by means of the variable that is associated with it. This is notated by affixing certain conditions after a variable, separated by a colon:

(541) s: ⟨ TAIL, s ⟩, ⟨ POSSESSION, poss-er:t,poss-ee:s ⟩; t: $uniqueness - sit_0 \models$ ⟨ INANIMATE, t ⟩

In such cases, the variable eventually gets bound by a binding operator in whose scope it lies. How this works will become clearer when we encounter anaphora and non–referential uses.

6.2.2 Proper names

According to causal theories of proper names, a proper name is, very crudely, the association of an expression with a particular entity by means of some initial 'baptism', which can then be used on various occasions to refer to that entity. Whilst it is the case that for any given entity and community of users there is a particular (not necessarily unique or simultaneous) such 'baptism', this does not entail in any way that the *expression* used differs from bearer to bearer.[3] Some proper name expressions do, presumably, have a unique bearer, and no one would wish it otherwise ('Zevulun Hammer'), but it does not seem to be a characteristic of such expressions.

Consider the expression 'Jill'. Any use of this expression to refer to a certain entity presupposes, if we follow the causal theory, that some 'baptism' took place, associating the expression as a name for that entity. When using the expression, the speaker relies on the fact that the bearer of the name was baptised, or more ecumenically *named.* Without this he cannot use the expression. Hence, a given use of the expression does not in and of itself fix its bearer. Only in conjunction with the additional 'naming' process does the value get fixed.

So, the meaning of 'Jill' might be described as follows:[4]

[3] Expression-*type*, of course.

[4] This account of proper names is essentially the one provided in Barwise and Perry 1983.

(542) ['Jill']($dis-sit_0, naming-sit_0$) = t, where the speaker is referring to t using 'Jill', and exploiting the existence of a naming-situation, $naming-sit_0$ in which the name 'Jill' was assigned to the person t.

(543) ['Jill']($dis-sit_0, naming-sit_0$) = t;
CONDITIONS-ON-VALUE: t: $dis-sit_0$ |= ⟨ REFERRED-TO,'Jill',t ⟩, $naming-sit_0$ |= ⟨ NAMED, 'Jill',t ⟩.

It is worth reiterating that bringing in a naming situation as a contextual parameter does not mean that the addressee will necessarily be able to fix that parameter, correctly or at all. It does mean that in order to get at the right content the addressee will need to find a way to fix the parameter, though she need not exploit the same naming situation as the speaker, as long as it is some naming situation in which that same entity got associated with the name 'Jill'.

Whenever we introduce resource situations into a meaning, remarks such as these apply: the means through which interlocuters identify particular resource situations are not asserted to be semantic, though of course they are a crucial pragmatic factor. All that is intended is that some such means be available, otherwise the (intended) content will not arise. Moreover, if the addressee is not able to fix the resource situation, he must be aware that fixing it is required. Hence, while he may not be able to comprehend the full extent of the content, since he knows the rules of the language, he can abduce to a partial, weaker content. In the case of a proper name 'Hmm, she must be talking about someone called Jill.'.[5]

Using this meaning, we can provide a meaning for the following sentence, by changing slightly the (simplified version of the) meaning description given in (539:

(544) ['I see Jill.']($dis-sit_0$) = ⟨ λx⟨ SEE, subj-role:x,obj-role: s ⟩, x: t ⟩;
CONDITIONS-ON-VALUE: t: $dis-sit$ |= ⟨ UTTERING, 'I', t ⟩;
s: $dis-sit_0$ |= ⟨ REFERRED-TO, 'Jill', s ⟩ $naming-sit_0$ |= ⟨ NAMED, 'Jill',s ⟩.

[5]This abductive process is what Barwise and Perry refer to as 'inverse information'.

6.2.3 Referential uses of definites and indefinites

Let us start by considering a definite such as 'The table'. For now, we assume that definites can be used in three ways: referentially, quantificationally (what amounts to 'attributively') and anaphorically. The anaphoric use of expressions in general is the topic of section (6.5).[6]

There are many tables in the world, even often in one room. Nonetheless, we assume that any referential or for that matter quantificational (and even anaphoric, as will be argued in section (6.5).) use of this expression carries with it a uniqueness presupposition of a sort. The force of the uniqueness is typically weak: there is a unique pope in the universe, but many tables in this office. Hence, the uniqueness, or 'differential salience', as some might prefer (McCawley 19??, Lewis 1979,), imputed in

(545) Put it on the table.

has to be relative to a small domain, put differently, it requires exploiting of a uniqueness or salience situation, in which the uniqueness or salience applies. When using the expression, the speaker relies on the fact that the property provided in the expression applies to pick a unique or most salient entity within that situation. Without this she cannot use the expression. Hence, a given use of the expression does not in and of itself fix its bearer, rather only in conjunction with the additional 'uniqueness' situation. Even if the addressee is not able to fix the resource situation, he must be aware that fixing it is required. Hence, while he may not be able to comprehend the full extent of the content, since he knows the rules of the language, he can abduce to a partial, weaker content. In this case, 'Let's see, she must be talking about some pretty obviously distinctive table.'

So, the meaning underlying a referential use of 'the table' is:

[6]Assuming the existence of a *semantic* referential/quantificational bifurcation is controversial (see e.g. Kripke 1979). This is a surrenderable assumption. Dropping the assumption involves eliminating the assumption that an act of reference can ever involve a definite description. This will remove the discourse marker introduced by the definite from being a parameter of the meaning description, and, as we will see, cause it to be existentially quantified away, although without any loss of the ability to account for uniqueness.

(546) ['The table']($dis-sit_0, uniqueness-sit_0$) = t, where the speaker is referring to t, which is a table, and exploiting the existence of a uniqueness-situation, $uniqueness-sit_0$: in which the property 'TABLE' is instantiated uniquely.

(547) ['The table']($dis-sit_0, uniqueness-sit_0$) = t;
CONDITIONS-ON-VALUE: t: $dis-sit_0$ |= ⟨ REFERRED-WITH, 'the table', t ⟩, $uniqueness-sit_0$ |= ⟨ TABLE, t ⟩;
$uniqueness-sit_0$: ⟨ UNIQUE, TABLE, $uniqueness-sit_0$ ⟩

In this specification, notice that the uniqueness and descriptive conditions are separated. This turns out to have a number of implications, not least that it will allow us to provide a very similar description of the meanings of interrogative 'which-phrases'.

This also makes clear that '$uniqueness-sit_0$' is merely a convenient label for a resource situation, just as '$naming-sit_0$' is. Labelling a situation with '$uniqueness-sit_0$' doesn't make uniqueness of a given property happen, it is forcing it to be a constituent of a fact of the schema ⟨ UNIQUE, PROPERTY, $uniqueness-sit_0$ ⟩ that does.

Referential uses of indefinites ('specific indefinites'), if such exist, place no uniqueness presupposition on their referent, but still require *some* domain from which to pick out the referent:

(548) ['A table']($dis-sit_0, domain-sit_0$) = t;
CONDITIONS-ON-VALUE: t: $dis-sit_0$ |= ⟨ REFERRED-WITH, 'a table', t ⟩, $domain-sit_0$ |= ⟨ TABLE, t ⟩;

6.2.4 Quantificational uses of descriptions

Indefinites and definites can also be used quantificationally. In such a case the role associated with the used expression is not filled, but rather gets quantified over. There are a number of changes that recognising this involves. The first is that the variable introduced by the use of the expression is no longer a parameter of the meaning description. All it does is introduce certain restrictions on the argument

role it is associated with, and then gets existentially quantified away at *some* point. Since we assume the syntactic expressions to which meanings are assigned are surface structures, syntactic position underdetermines the scope of an expression. Hence, the scope a given use will have is a contextual parameter: in order for the expression to make its semantic contribution, the context has to fix which scope it is to have within the full utterance of which it forms a subutterance. Remember once again what the force of making a component of meaning context-dependent is: no more than saying that the expression does not determine how this parameter gets fixed. This parameter in conjunction with a storage-like mechanism will be used to generate variable scopes.[7]

Correlating scope with context rather than syntax is not intended as a mere notational redistribution of labour. Thus, for instance, if topic/focus structure plays a role in determining which scope is intended on a given use, and this is represented as a contextual fact, then this can play a role in determining how this parameter gets fixed on a given use. We will not provide any instances of such a treatment with respect to quantifiers, but will show the advantages of such an approach with respect to interrogative scope determination, most crucially in the case of reprise uses.

(549) a. Jill didn't find a hammer.

b. $\neg\exists$ Jill find x: x: hammer,x.

c. $\exists\neg$ Jill find x: x: hammer,x.

Thus, if (549a) can give rise to two different contents, schematically given in (549b,c), then according to the way we individuate meanings, this sentence has two meanings. One maps a class of contexts onto the content in (549b), the other maps a class of contexts to yield the reading in (549c).

The indefinite *expression* has *one* quantificational meaning, where the contextual parameter that is to get fixed is the scope its use gets assigned within the use of the entire expression. What we change about the description of a referential use of an

[7]See Gawron and Peters 1990a for extensive discussion of this view of quantification.

indefinite, is dropping the reference condition, and replacing it with a condition fixing its scope:

(550) a. $dis - sit_0 \models$ ⟨ REFERRED-TO, 'a table',t ⟩

b. $dis - sit_0 \models$ ⟨ SCOPING-POINT, 'a table', AT: $scope - of - use_0$ ⟩

In general, SCOPING-POINT relates a use of an expression, in this case 'a table', to the (use of) the maximal constituent where it has scope. The presence of a SCOPING-POINT fact in the meaning description has the following effect: it serves as an instruction for an existential closure operator to bind the variable associated with the indefinite at the point specified by the 'AT' constituent of the SCOPING-POINT fact.

More precisely, we revise the Skel-Cont's of our VP and S interpretation rules as follows:

(551) S $(dis - sit_0)$ = EX-CLOSURE(⟨ Skel-Cont(VP),Skel-Cont(NP) ⟩)

a. [VP]$(dis - sit_0)$ = λx EX-CLOSURE(⟨ Skel-Cont(V), subj-role:x,obj-role: Skel-Cont(NP) ⟩)

'EX-CLOSURE' is a function that takes as input a SOA with certain variables free and a use of an expression A_0, and returns a SOA, in which each variable associated with a use of an indefinite whose scope is specified to terminate at A_0 is existentially quantified away:

(552) EX-CLOSURE$(A_0, \sigma) = \exists Skel{-}Cont(a_1), \ldots, \exists Skel{-}Cont(a_n)\sigma$, where $a_1, \ldots, a_n$ is the longest sequence of NP sub-utterances of A_0 such that for any i, ⟨SCOPING-POINT, a_i, AT: A_0 ⟩

Let us consider a meaning description for the following sentence, where the indefinite is used quantificationally. Schematically,

(553) ['Jill saw a table.']$(dis - sit_0)$ = ∃ t ⟨ λx⟨ SEE, subj-role:x, obj-role: t ⟩, x: **jill** ⟩;
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ SCOPING-POINT, 'a table', AT 'Jill saw a table' ⟩ t: $domain - sit_0 \models$ ⟨ TABLE, t ⟩

The important thing to notice is that t is no longer a parameter of this meaning description. It has been existentially quantified away. This happens precisely because of the presence of a SCOPING-POINT fact which specified that t was to be existentially quantified away at the S-level. On the other hand $domain - sit_0$ is still a parameter of the meaning description: it provides the domain over which the existential quantification varies.

In order to see how this can make a difference, let us consider first a slight variant of the above sentence, where the negation scopes over the indefinite, as forced by the fact ⟨ SCOPING-POINT, 'a table', AT: 'didn't see a table' ⟩:

(554) ['Jill didn't see a table.']($dis - sit_0$) =⟨ λx ¬∃ t⟨ SEE, subj-role:x, obj-role: t ⟩, x: **jill** ⟩
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ SCOPING-POINT, 'a table', AT: 'didn't see a table' ⟩ t: $domain - sit_0$ |= ⟨ TABLE, t ⟩

No surprises here: Jill is asserted to have the property of being a person x such that there does not exist any thing t such that t is a table in $domain - sit_0$ and x saw t. With a *definite*, however, the existence of the uniqueness-situation parameter provides some interest:

(555) ['Jill didn't see the table.']($dis - sit_0$) =⟨ λx ¬∃ t⟨ SEE, subj-role:x, obj-role: t ⟩, x: **jill** ⟩
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ SCOPING-POINT, 'the table', AT: 'didn't see the table' ⟩ t: $uniqueness - sit_0$ |= ⟨ TABLE, t ⟩; uniqueness-sit: ⟨ UNIQUE, TABLE, $uniqueness - sit_0$ ⟩

In this case, Jill is asserted to have the property of being a person x such that there does not exist any thing t such that t is a table in $uniqueness - sit_0$ and x saw t. But by the condition ⟨ UNIQUE, TABLE, $uniqueness - sit_0$ ⟩, we know that there does exist a table in $uniqueness - sit_0$:, a unique one in fact. Call it t_0. Then, the sentence means that Jill didn't see t_0. (More precisely, any use of the sentence and fixing of the uniquness-sit parameter will fix t_0 etc.) Thus, simply quantifying away a definite, makes little difference to the descriptive content. In section (6.5.

we will see how in anaphoric uses of definites, their uniqueness situation parameter also gets quantified away. This will have a number of interesting consequences for interrogatives as well.

Summing up, the meaning description of a quantificational use of an indefinite will be the following:

(556) ['A table']($dis-sit_0, domain-sit_0, scope-of-use_0$) = t;
CONDITIONS-ON-VALUE: t: $dis-sit_0 \models$ ⟨ SCOPING-POINT, 'a table', AT: $scope-of-use_0$ ⟩; $domain-sit_0 \models$ ⟨ TABLE, t ⟩

6.2.5 Quantificational expressions

Why separate away quantificational expressions from definite and indefinite descriptions? This is intended to capture asymmetries in behaviour between the two classes of expressions: quantificational expressions *must* be used to quantify, whereas definites and indefinites *can* be used to quantify, but also have deictic, and in the case of definites, anaphoric uses. The implications of this move in the current work will become clear in section (6.5) where we show how anaphoric uses of definites impose strong constraints on their scopal possibilities. A similar reason will lie at the heart of our account of the quantifier/interrogative asymmetries in Bach Peters sentences.

We stick here with a fairly simple Generalised Quantifier analysis of quantificational expressions. We assume that the quantificational force and restrictive term relation of any quantificational expression is fixed context independently.[8] Thus, a meaning description for a quantificational expression specifies a Skel-Cont, a variable as before, a Quant-Force, and a Restr-Term. There are two discourse parameters, then, that fix a given contribution of a quantificational expression, the domain over which it quantifies and its scope. For simplicity we ignore the contextual variability of the restrictive term. Thus, we treat restrictive terms of quantifiers as constants, unless this affects the analysis materially (e.g. Bach-Peters sentences.)

(557) ['Each man']($dis-sit_0, domain-sit_0, scope-of-use_0$) = t; Quant-Force: EACH. Restr-Term:MAN;

[8]This seems not to be the case for some determiners such as 'most' and 'many'.

CONDITIONS-ON-VALUE: t: $dis - sit_0 \models$ ⟨ SCOPING-POINT, 'each man', AT: $scope - of - use_0$ ⟩

We need to make very minor amendments to the scope storage and retrieval mechanism sketched in the previous section for descriptions to accommodate quantificational expressions.

Two revisions are required: first SCOPING-POINT is expanded to allow for one (use of a) quantifier to be scoped above the use of another quantifier, where the narrowest scoping quantifier is specified as scoping over the maximal subutterance where it has scope.

Second, we need to expand EX-CLOSURE in such a way that it scopes in quantifiers, in addition to existentially closuring descriptions. The generalised closure function will be called 'QUANT-CLOSURE'. 'QUANT-CLOSURE' is a function that takes as input a SOA with certain variables free and a use of an expression A_0, and returns a SOA, in which each variable associated with a use of a quantifier or indefinite is scoped as specified by the SCOPING-POINT facts, where the narrowest scoping NP is specified to terminate at A_0:

(558) QUANT-CLOSURE(A_0, σ) = $\exists Skel - Cont(a_1), \ldots \exists Skel - Cont(a_{i-1})$
⟨ $QUANT - FORCE(a_i), RESTR - TERM(a_i)$, $\lambda Skel - Cont(a_i) \exists Skel - Cont(a_{i+1}), \ldots, \exists Skel - Cont(a_{i+j_i})$
⟨ $QUANT - FORCE(a_n), RESTR - TERM(a_n)$, $\lambda Skel - Cont(a_n) \exists Skel - Cont(a_{n+1}), \ldots, \exists Skel - Cont(a_{n+j_n})$ σ ⟩ ...⟩ where $a_1, \ldots, a_{n+j_n}$ is the longest sequence of NP sub-utterances of A_0 such that for any i ⟨SCOPING-POINT, a_i, AT: a_{i+1} ⟨SCOPING-POINT, a_{n+j_n}, AT: A_0 ⟩

For example:

(559) ['Every man squints.'](*dis* − sit_0) = ⟨ EVERY, MAN, λx ⟨ λt ⟨ SQUINT, squinter: t ⟩ t:x ⟩ ⟩
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ SCOPING-POINT, 'every man', AT: 'Every man squints' ⟩

x is no longer a parameter of this meaning description. It has been bound in the nuclear scope. Why? Because of the presence of a SCOPING-POINT fact which specified that this was to occur at the S-level.

A sentence such as the following has three possible meanings, differing with respect to the SCOPING-POINT facts occurring in their meaning descriptions:

(560) a. Every woman likes some person.

b. ⟨ SCOPING-POINT, 'every woman', AT: 'Every woman likes some person' ⟩ ⟨ SCOPING-POINT, 'some person', AT: 'Every woman' ⟩ (OBJ has wide scope)

c. ⟨ SCOPING-POINT, 'every woman', AT: 'some person' ⟩ ⟨ SCOPING-POINT, 'some person' AT: 'Every woman likes some person' ⟩ (SUBJ has wide scope)

d. ⟨ SCOPING-POINT, 'every woman', AT: 'every woman likes some person' ⟩ ⟨ SCOPING-POINT, 'some person', AT: 'likes some person' ⟩ (OBJ has scope at VP)

6.3 Syntactic assumptions

In this section we outline the general assumptions we make about syntactic structures, particularly interrogative structures. For reasons discussed at length in previous sections, we assume that interpretation proceeds from surface structure of some ilk. In principle, these could be the S-structures argued for within the principles and parameters approach, or the syntactic structures provided by 'unification based' frameworks such as LFG or G/HPSG. For concreteness, we provide an analysis within HPSG, a framework that does not assume a level of logical form, and hence assumes syntactic input to and constraints on meaning need to provided at an essentially surface level.

6.3.1 General assumptions about interrogative syntax

We make three general assumptions about interrogative syntax: we assume the syntax can provide for

- Categorial distinctions between interrogative sentences and declarative sentences.
- Constraints on movement/dislocation of interrogative phrases.
- Constraints on the scopal possibilities of certain interrogative forms.

6.3.2 Declarative/Interrogative sentence distinctions

We consider evidence pointing to the need for syntactic distinctions between forms that are, intuitively, interrogative syntactically and semantically and forms that are declarative syntactically, but have interrogative contents. This is conceivably a characteristic of languages that have wh-fronting, given that in languages where such fronting does not exist, some of these distinctions do not arise. In chapter 7, we will show one instance that supports this assumption concerning embedded interrogatives in Chinese. Beyond that we do not explore the cross-linguistic possibilities of this assumption in the current work.

Sentences such as

(561) Who asked where the boys bought what

are two ways ambiguous in wh-fronting languages. The leftmost embedded wh-phrase must be scoped at the embedded level, whereas the scope of *in situ* embedded wh-phrases is indeterminate between the matrix and embedded levels. That it is the left-most rather than any element in COMP is an observation we owe to Ivan Sag (p.c.):

(562) a. Who knows which friends of which politicians left which cars parked out.

b. Bill knows which friend of Bill C left the Jeep parked, Max knows which friend of Dan P left the Isuzu,...

In languages without wh-fronting, apparently, a three way ambiguity is found: either of the embedded wh-phrases can receive matrix scope. (see e.g. Hankamer 1974). However, this is the case in English as well in certain cases:

(563) Which mathematician knows which problem has which solution.

This sentence can be used standardly and elicits (at least) two types of responses:

(564) a. Gauss does.

b. Gauss knows problem A has solution B, Fermat knows problem C has solution D,...

This sentence can also have a reprise use of the embedded subject, in which case the argument role associated with that phrase has widest scope:

(565) Which mathematician knows WHICH PROBLEM has WHICH SOLUTION?

Note that embedded interrogative sentences cannot have such a use:

(566) * Who knows/asked WHERE the boys bought what?

Similar remarks apply to sentences like (567) where for purely semantic reasons the embedded subject cannot be scoped in at the embedded level: the relation denoted by 'think' cannot embed 'resolving answers' for reasons hinted at in chapter 1 and discussed in chapter 3. If the embedded subject were forced to have embedded scope, one could not account for the availability of the two acceptable, non-reprise interrogatory uses it has:

(567) a. Which mathematician thinks which problem has which solution?

b. # Gauss does.

c. Gauss thinks problem A has solution B.

d. Gauss thinks problem A has solution B, Fermat thinks problem C has solution D,...

This suggests that the syntax can place different restrictions on the possible scopes of syntactically interrogative sentences from those of syntactically declarative sentences.

We note a number of converse facts the nature of which we do not understand clearly as yet. Non-fronted interrogative phrases cannot take embedded scope when the embedding complementiser is 'whether'. This applies to alternative phrases and wh-phrases alike.[9] This is brought out for the alternative phrase by the following fact: mixed alternative/wh questions are for some reason infelicitous. The only use (568) has is as a reprise for an antecedent query:

(568) Who likes [John or Bill]?

The alternative phrase in (569b) can only be used to reprise, which is expected if the alternative phrase cannot be scoped at either the embedded level, or the matrix level:

(569) a. Jill wonders whether Mike likes which person/who. (Can only be used to reprise.)

[9]We owe this observation to Ivan Sag.

b. Who wonders whether Mike likes [Tony or Cathy] (Can only be used to reprise.)

As we have discussed above, there seem to be different contextual restrictions regulating the felicitous use of sentences that have interrogative meanings.

Thus, a sentence like

(570) Mike likes who/which person.

can, in appropriate contexts, be used to make both reprise and standard queries, as discussed in sections 4 and 5. This means that no semantic account is apparent for the impossibility of scoping the interrogative phrase at the embedded level in the following:

(571) a. Bill knows (that) Mike likes who/which person. (Can be used to reprise or in a biassed context.)

b. *Bill wonders (that) Mike likes who/which person.

This contrast will have to be reflected in different subcategorisation frames of 'know' and 'wonder'.

Moreover, as Grimshaw 1979 pointed out, the verb 'wonder' does not subcategorise for NP's or 'that clauses', whereas a verb that denotes a relation of the same semantic type, namely 'ask' does not subcategorise for 'that clauses' but does subcategorise for NP's. This suggests that in order to state the subcategorisation requirements of 'wonder' recourse will have to be made to a syntactic category distinct from that subcategorised by 'ask':

(572) a. Bill asked/wondered who Jill likes.

b. Bill asked/* wondered Mike's phone number.

c. * Bill asked/wondered that Mike likes Mary.

6.3.3 Assumptions about unbounded dependencies

The current approach is compatible with either movement or unification conceptions of long-distance dependency. The fundamental intuition the metaphor of movement captures is *complementarity* between the gap and the dislocated phrase. At one level a phrase occupies one position, at a different level, this same phrase occupies a different position, the original position containing solely a trace indicating that at a 'previous' level it was occupied. In line with this is our basic assumption concerning the semantic contribution of a trace, namely that it makes no independent semantic contribution to the content. The interpretation procedure we propose ends up as similar to movement analysis with reconstruction, one difference being that in our case, wh-phrases bear no (binding) operator, rather their contribution consists solely of a variable with restrictions on it. All contributed variables end up as bound by a special type of binding operator, analogous to indefinites, as will be discussed shortly.

Our interpretation procedure is also in line with the unification or phrase linking approaches, where the filler and gap are assumed to be copresent and describe syntactic and semantic information that is compatible. The trace serves as a place holder for the meaning provided by the filler, in other words, it gets unified entirely with the semantics of the dislocated wh-phrase. Thus, the content of a sentence that has a dislocated wh-phrase is constructed in similar fashion to that of a topicalized sentence: the dislocated phrase shares a variable with the *in situ* argument role, while the restrictions and scope are either obligatorily stored (PLG) or only become part of the description of the sign when the syntactic dependency is discharged (HPSG).

Given that the account is couched within HPSG, we make use of traces in interpreting *argument* dislocated wh-phrases. This is not an essential assumption and a traceless analysis could be adopted without any consequences for the semantics. Thus, we make use of no semantic distinctions associated with the existence of traces such as functional traces etc. A more subtle point concerns adjunct dislocated wh-phrases: it is currently a matter of some controversy whether adjuncts traces should be postulated or not. For simplicity, we assume they do, but this is a matter that could be revised without major consequences.

6.3.4 Island constraints

Given that interrogative forms that violate the following constraints have no use, independent, dependent or reprise, we assume the syntax has to rule out such forms as ill-formed:

(573) a. *WHAT$_i$ did Mike tell Mary that t$_i$ intrigued you? (Subject condition)

b. * WHO$_i$ do you like Iolanda and t$_i$? (Coordinate structure constraint).

c. *What$_i$ did he find a red t$_i$? (Unit movement constraint.)

The status of the Wh-island constraint as a syntactic condition seems much less clear: it does not seem to rule *out* interrogative forms, but rather restricts forms that violate it to reprise and to standard queries in biassed contexts. Evidence from other languages such as Romanian and Swedish apparently supports this line:

(574) What$_i$ did you ask whether Bill liked t$_i$

Pollard and Sag 1992 question whether various examples assumed infelicitous because of complex noun phrase constraint violations should be derivable from syntactic principles. They suggest that definiteness factors are involved in the infelicity of

(575) Here is the book that Leslie denied the claim that Kris had written.

When these factors are controlled for, acceptability is improved markedly, as in the following example from Maling and Zaenen 1982:

(576) Which rebel leader would you favour a proposal that the CIA assassinate?

6.3.5 Interrogative syntax within HPSG

We proceed to discuss how the central assumptions above are incorporated into the HPSG framework whose syntactic structures we use in meaning descriptions. For further details on various syntactic issues, see Pollard and Sag 1992.[10]

[10]In fact, HPSG provides descriptions of *signs*, essentially all semantic, syntactic and phonological aspects of an utterance type. In the current work we conceive of meaning as a relation between

Basic principles

HPSG regulates the well-formedness of its *signs*, as in other syntactic frameworks, by imposing various general principles these signs are supposed to meet. A sign has two essential types of features, *local* and *non-local* features. Local features specify essentially lexical information determining syntactic category such as subcategorisation information, case etc. Two principles regulate the 'percolation' of such features, the head feature principle and the subcategorisation principle.

The following are the definitions and basic intuitions behind these principles, as explicated in Pollard and Sag 1992:

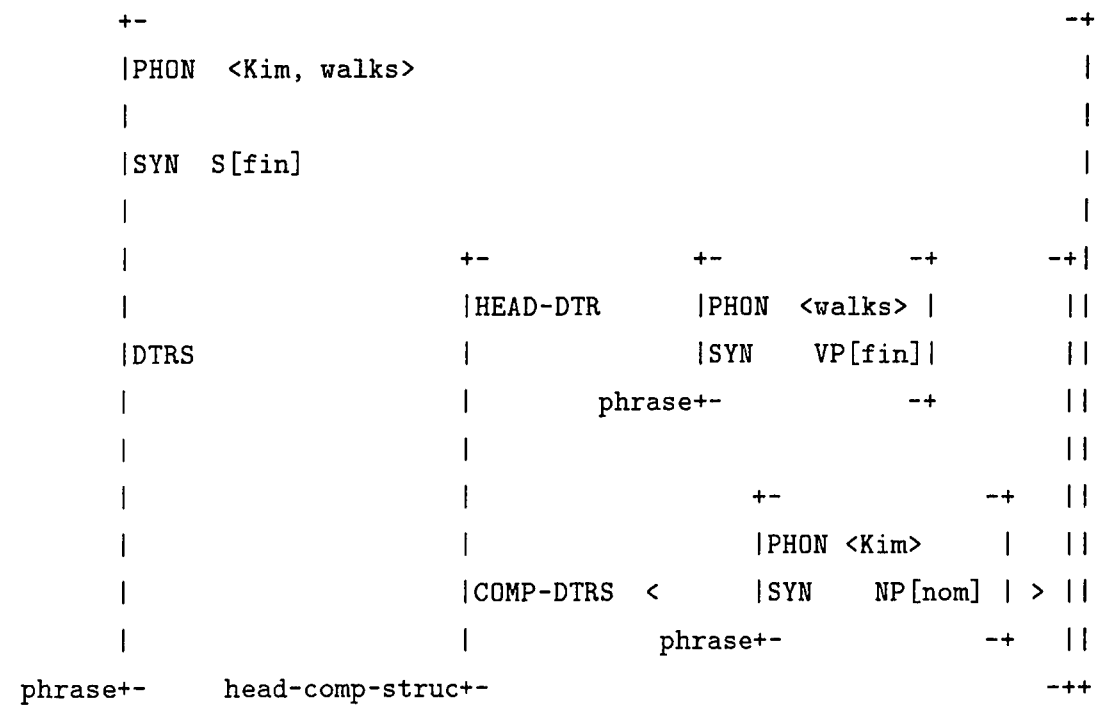
> **Subcategorization Principle:**
> In a headed phrase (i.e. a phrasal sign whose *DTRS* value is of sort **head-struc**), the *SUBCAT* value of the head daughter is the concatenation of the phrase's *SUBCAT* list with the list (in order of increasing obliqueness) of *SYNSEM* values of the complement daughters.

The effect of this principle is to 'check off' the subcategorization requirements of the lexical head as they become satisfied by the complement daughters of its phrasal projections; at the same time, the *SUBCAT* elements themselves are token-identical to the *SYNSEM* values of the corresponding complements. Thus the subcategorization principle works much the same way as cancellation in categorial grammar.

> **Head Feature Principle:**
> The *HEAD* value of any headed phrase is structure-shared with the *HEAD* value of the head daughter.
>
> The effect of the HFP is to guarantee that headed phrases really are 'projections' of their heads. (Pollard and Sag 1992, p.19)

---

syntactic expression types and the contents uses of these expressions give rise to. HPSG, then, provides in its descriptions objects intrinsically richer than is needed for the meaning descriptions provided here. Hence, we make use solely of a projection from the descriptions HPSG provides, namely those aspects of a sign that come under a rubric of 'syntactic expression'.



In the sequel, we adopt a number of notational conventions for displaying phrasal structures. We use either rewrite-rule or tree notation for displaying mother/daughter dominance. For instance,

(577) S[fin] → (C(omplement-Daughter):NP[nom], Kim), (H(ead-Daughter):VP[fin], walks)

Non-local features are used to regulate information concerning unbounded dependencies involving relative clauses, topicalisation and interrogative dependencies. We make use of a feature SLASH for propogating syntactic information related to unbounded dependencies, and a feature QUE specifically associated with syntactically interrogative sentences. This will be used to constrain the scope of expressions associated with certain distinguished 'positions', as well as to propogate unbounded interrogative dependencies in 'pied piping'. All non-local features are regulated by a principle dubbed the *Non-local feature principle*, stating roughly that the value of

each nonlocal feature on a phrasal feature is the union of the values on the daughters. We will see how this works for SLASH in an upcoming section and for QUE in section (6.3).

Interrogative/Declarative distinctions

HPSG assumes the existence of a number of Immediate Dominance (ID) schemata analogous to the X-bar schemata of GB. These schemata can be cross-classified, roughly, by means of a sort pertaining to different sentential types. We assume that the possible sub-attributes of this sort (i.e. the subsorts) include DECL(ARATIVE), corresponding, intuitively to a declarative specification, and INT(ERROGATIVE), corresponding to an interrogative specification. This sort is analogous to the feature **wh** used in GB to subclassify CP's. The resulting schema/sentence-type cross-classifications, then, provide us with different syntactic structures, each of which will be provided with its own meaning description.

The ID schemata we assume to be cross-classified in this way provide us with a NP/VP rule and a rule for dislocated phrases.

(578) (S[fin], H:[1], SUBCAT:<>) → (H,(VP[fin],H:[1],SUBCAT < [2] >)), (C, [2] (NP[nom])

In assuming the existence of syntactically interrogative sentences of this structure, we follow the GPSG analysis of subject questions as not involving a dislocation of the subject interrogative. Nothing in the semantic analysis we propose rides on this.

(579) S[fin] → (H,S[fin, INHER | SLASH([1]),..., TO-BIND | SLASH([1])), (F(iller-Daughter),[1])

This schema is supposed to license 'dislocation' structures such as sentences with fronted interrogatives and topicalisation. It is assumed to diverge into two sub-schemas, one for root sentences that contains the specification [+INV] on the head, the other for embedded sentences, which must contain the specification [-INV].

Dislocated structures

The HPSG analysis of dislocation builds on the original phrase structure analysis proposed by Gazdar 1981. The basic idea is that a dependency is introduced by a trace. This is stored and transmitted up the tree by means of a storage mechanism, formally specifyied by the non-local feature SLASH as bearing the local features of the trace. Finally, the dependency is discharged by emptying the store.

Traces A trace is assumed to be a special lexical item, as shown in (580):

(580) trace → (LOCAL:[1], NON-LOCAL:(INHER | SLASH:[1]))

A trace is *specified* for no local features, but as a complement of a head will structure share whatever local features the head specifies. As far as nonlocal features go, the only nonempty value is the SLASH value, which is a singleton set containing whatever the local features of the trace are.

Since a trace has its semantic contribution unified with that of the filler, it has the following meaning description:

(581)

[trace[LOCAL[1], INHER | SLASH([1])]](*dis* − sit_0,use-of-filler$_0$(LOCAL[1]) = t,
CONDITIONS-ON-VALUE: ⟨ = t, Skel-Cont(use-of-filler$_0$) ⟩

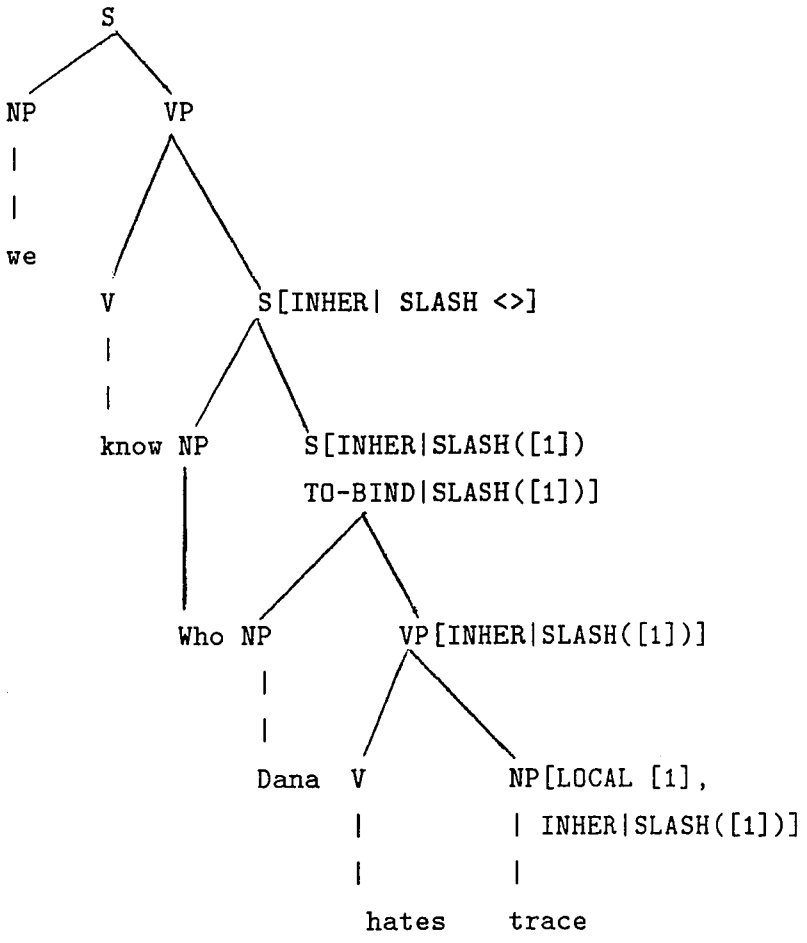
Inheritance of SLASH The Nonlocal Feature Principle controls the inheritance of SLASH: it guarantees that those nonlocal dependencies which become bound off are subtracted from the set of nonlocal feature values that are passed up to the mother. The way this is done is by assuming that the binding of a nonlocal dependency is always declared on the head daughter of the structure in question:

> **Nonlocal Feature Principle:**
>
> For each nonlocal feature, the INHERITED value on the mother is the union of the INHERITED values on the daughters minus the TO-BIND value on the head daughter. (Pollard and Sag 1992, chapter 4, p.8)

Thus, the way a dependency is bound off is by identifying the TO-BIND feature with the value of the SLASH store at the level where the filler is introduced:

(582) X → (H,S[fin, INHER—SLASH([1]), TO-BIND—SLASH ([1])]), (F,[1])

A simple example showing how this works is:



In the following section, once we introduce the semantic apparatus for interrogatives, we will see how this principle controlling non-local features can be used to bind off QUE dependencies.

6.4 Independent uses of wh-phrases

6.4.1 α-abstraction

In this current section, we provide an account of the independent use of interrogative phrases, which for unary wh-questions is thought of as their 'wide scope' use.

Building on the results of chapter 1, we argued in section (4.2) that one possible use, the independent use, of a h-phrase resulted in an interrogatory use of a sentence like (583a) giving rise to a query whose descriptive content is, schematically, the unresolved SOA depicted in (583b):

(583) a. Who likes Bill.

b. ⟨ λx ⟨ LIKES,liker:x,likee: **bill** ⟩ x:– ⟩

Let us recall exactly what work variables do in describing the quantificational use of an indefinite associated with a certain argument role: the variable acts as a place-holder, i.e. it prevents any *entity* from being associated with the argument role, and it provides additional restrictions on that argument role. Ultimately, the variable gets existentially quantified away. All the functions the variable performs are needed in the interrogative case, save for the fact that a variable introduced to describe a wh-phrase use should not get existentially quantified away, given the content that we have argued for:

(584) ⟨ λx ⟨ LIKES,liker:x, person x,likee: **bill** ⟩ x:– ⟩

Given the need to avoid associating a quantifying-in with the contribution of each wh-phrase, argued for at great length above, we make recourse to a closure operator at a sentential level, which, motivated by various facts we saw above such as the

lack of interaction with adverbs of quantification, we assume scopes just wider than quantificational closure. The effect of this closure operation which we dub α-closure is to create an unresolved SOA, whose main relation is obtained by abstracting over the role associated with independent use and whose argument role is unresolved. In fact, the operation we define is applicable to more than one variable simultaneously in which case a multiply unresolved SOA will result.

(585) α x ⟨ LIKES, liker:x, likee:**jill** ⟩ $=_{def}$ ⟨ λx⟨ LIKES, liker:x likee:**jill** ⟩, x:–⟩

(585) is a simple example. Here the SOA in which the variable x, associated with the **liker** argument role, was previously free, is mapped by α-abstraction to the unresolved SOA, whose main relation is the property of 'being a 'liker of **jill**', and whose argument role is unresolved.

(586) α y ⟨ EVERY, WOMAN(x), λx ⟨ LIKES,liker: x, likee: y ⟩ ⟩ $=_{def}$
⟨ λy⟨ EVERY, WOMAN(x), λx ⟨ LIKES,liker: x, likee:y ⟩ ⟩, y:– ⟩

In (586) the SOA in which the variable y, associated with the **likee** argument role, was previously free, is mapped by α-abstraction to the unresolved SOA whose main relation is the property of 'being liked by every woman' and whose sole argument role is unresolved.

(587) α x,y ⟨ GIVE, giver:x, object-given:y, recip:j ⟩ $=_{def}$
⟨ λx,y ⟨ GIVE, giver:x, object-given:y, recip:j ⟩, x:–,y:–⟩

In (587) the SOA in which the variable y, associated with the **object-given** argument role and the variable x associated with the **giver** argument role, were previously free, is mapped by α-abstraction to the unresolved SOA whose main relation is the binary relation such that 'x gave y to j', both of whose argument roles are unresolved.

In general,

(588) $\alpha x_1, \ldots, x_n$ ⟨ Q, ... $r_1 : x_1, \ldots, r_n : x_n$ ⟩ $=_{def}$
⟨ λ $x_1, \ldots, x_n$ ⟨ Q, ... $r_1 : x_1, \ldots, r_n : x_n$ ⟩, x_1:–,...,x_n:– ⟩

With this basic idea of how the independent use of an interrogative-phrase is described, we can proceed to provide meaning descriptions for interrogative phrases and rules for their combinatorial contribution.

Meaning descriptions for 'who' and 'what'

Recall that we suggested the following as a meaning description for a quantificational use of an indefinite:

(589) a. ['A person']($dis-sit_0, domain-sit_0, scope-of-use_0$) = t;
CONDITIONS-ON-VALUE: t: $dis-sit_0$ |= ⟨ SCOPING-POINT, 'a person',
AT: $scope-of-use_0$ ⟩; $domain-sit_0$ |= ⟨ PERSON, t ⟩;

An entirely analogous meaning description applies to 'who':

(590) ['Who']($dis-sit_0, domain-sit_0, absorption-point_0$) = t;
CONDITIONS-ON-VALUE: $dis-sit_0$ |= ⟨ α-IND-SCOPING-POINT,'who',
AT: $absorption-point_0$ ⟩; t: $domain-sit_0$ |= ⟨ PERSON, t ⟩;

The condition $dis-sit_0$ |= ⟨ α-IND-SCOPING-POINT,'who', AT: $absorption-point_0$ ⟩, links the argument role associated by the utterance of 'who' to the maximal subutterance in which it has scope. This is quite analogous to the 'SCOPING-POINT' conditions occuring in quantificational uses of indefinites. Their respective contributions to meaning will be different because of the different closure operators that apply to them.

The role of the domain-situation here is to provide the universe from which answers originate. More precisely, it provides possible instantiators for the unresolved role and a domain for quantifiers over that role. Any use of this phrase requires fixing this parameter, failure to do so results, as usual, in failure to get to the (intended) content.

Quite analogously, we obtain the following meaning description for 'what':

(591) ['What']($dis-sit_0, domain-sit_0, absorption-point_0$) = t;
CONDITIONS-ON-VALUE: $dis-sit_0$ |= ⟨ α-IND-SCOPING-POINT,'who',
AT: $absorption-point_0$ ⟩; t: $domain-sit_0$ |= ⟨ INANIMATE, t ⟩

6.4.2 Rules for interrogative meanings

Basic idea We now see how the two aspects of interrogative meaning we have specified above combine to yield a sentential interrogative meaning. The one component

is a variable that acts as a place holder in an argument role associated with an interrogative phrase use, and provides additional restrictions on the argument role. The other is an indication at which sentential level the variable is input to α-closure.

Syntactic constraints on scope The choice of which level to be closured at is free for any interrogative phrase subject to the following syntactic constraint: an interrogative phrase marked with the feature QUE is forced to be closured locally.[11] We assume that for English QUE is attached (uniquely) to the left-most element of any given syntactically *interrogative* sentence. This effect will be achieved by imposing as a defining characteristic of interrogative sentential sorts that they (or a distinguished constituent of theirs) must contain at least one element marked with QUE, optionally marking all interrogative phrases with QUE, and imposing a linear precedence rule that forces a phrase marked with QUE to precede all phrases. QUE, as a non-local feature, is inherited exactly like SLASH is.[12]

The rules

(592) a. S[fin,+INT][1] → (H,(VP[fin], TO-BIND | QUE([2]))), (C, NP[nom,INHER | QUE([2])]) [INHER | QUE] < X

b. [S]($dis - sit_0$) = α-CLOSURE(QUANT-CLOSURE(⟨ Skel-Cont(VP), Skel-Cont(NP) ⟩))
CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP);
$dis - sit_0$ |= ⟨ α-SCOPING-POINT, [2], AT: [1] ⟩

Two points require comment to understand the workings of the rule: the first point concerns α-closure. This is a function entirely analogous to QUANT-CLOSURE in its workings. Given a SOA with some free variables σ and a use of an expression A_0, it returns an unresolved SOA, the product of α-abstraction over those variables

[11] In the current work, this condition is simply stipulated as part of the meaning of an interrogative sentence. Whether this condition can ultimately be eliminated or derived from some more general principle is a matter we do not pursue here.

[12] We owe this particular proposal for capturing the syntactic scopal restriction to Ivan Sag.

associated with argument roles, specified to be absorbed by the facts in the meaning description of that use of A_0.

Formally:

(593) α-CLOSURE$(A_0, \sigma) = \alpha Skel{-}Cont(a_1), \ldots, Skel{-}Cont(a_n)\sigma$, where $a_1, \ldots, a_n$ is the longest sequence of NP sub-utterances of A_0 such that for any i, ⟨ α-IND-SCOPING-POINT, a_i, AT: A_0 ⟩

The second point to notice concerns the one scopal restriction specified by the rule: the role associated with the utterance of the expression stored in QUE must be scoped at the current sentential level. Notice that the relation specified in the SCOPAL RESTRICTION is α-SCOPING-POINT rather than α-IND-SCOPING-POINT: the former subsumes the latter and will also be applicable to scopal restrictions concerning dependent uses.

The rule for interpreting dislocated structures can now be stated without any additional explanations, since it is entirely analogous:

(594) a. S[fin,+INT] [3] → (H,S[fin, INHER—SLASH([1]), TO-BIND—SLASH([1]), TO-BIND | QUE([2])]), (F,[1](INHER | QUE([2])) [INHER-QUE] < X

b. [S]$(dis - sit_0) = \alpha - CLOSURE($ Skel-Cont(H))
CONDITIONS-ON-VALUE: combine the Restr-Cont(H) with the Restr-Cont(F);
$dis - sit_0 \models$ ⟨ α-SCOPING-POINT, [2], AT: [3] ⟩

Our declarative sentence rules will be entirely analogous apart from lacking the scope restrictions deriving from the interrogative marked with QUE:

(595) a. S[fin,+DECL][1] → (H,(VP[fin]), (C, NP[nom])

S $(dis - sit_0)$ = α-CLOSURE(QUANT-CLOSURE(⟨ Skel-Cont(VP), Skel-Cont(NP) ⟩))
CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP)

(596) a. S[fin,+DECL] → (H,S[fin, INHER—SLASH([1]), TO-BIND—SLASH([1]]), (F,[1])

S $(dis - sit_0)$ = α-CLOSURE(Skel-Cont(H))
CONDITIONS-ON-VALUE: combine the Restr-Cont(H) with the Restr-Cont(F)

6.4.3 Some examples

Let us consider some examples to see how these rules work. We project away from aspects of meaning irrelevant to the matter at hand (conditions on proper names etc.) We also adopt the convention of omitting α-SCOPING-POINT conditions from meaning descriptions once the appropriate variables have been bound.

A subject unary wh-interrogative sentence

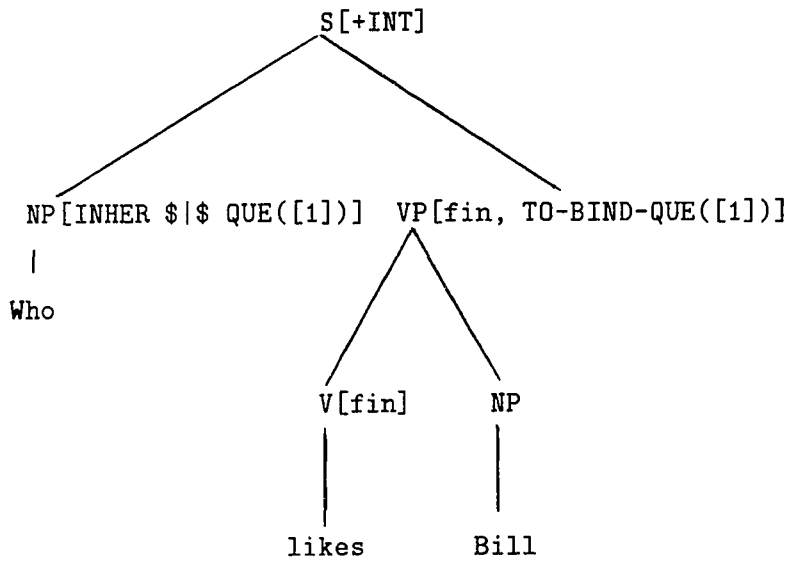
(597) a. Who likes Bill.

b. Skel-Cont: αs ⟨ λx ⟨ LIKE, subj-role:x,obj-role: bill ⟩ x:s ⟩

(By the definition of α-binding, this is equivalent to:)

Skel-Cont: ⟨ λs ⟨ λx ⟨ LIKE, subj-role:x,obj-role: bill ⟩ x:s ⟩ s:- ⟩

In detail:



(598) a. ['likes Bill'] $(dis - sit_0) = \lambda$ x ⟨ LIKE, subj-role:x,obj-role: **bill** ⟩

b. ['who']$(dis - sit_0, domain - sit_0)$ = t;
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ α-IND-SCOPING-POINT, 'who',
AT: 'who likes Bill' ⟩; t: $domain - sit_0 \models$ ⟨ PERSON, t ⟩

c. ['who likes Bill']$(dis - sit_0) = \alpha$ t ⟨ λ x ⟨ LIKE, subj-role:x,
obj-role: **bill** ⟩ x:t ⟩;
CONDITIONS-ON-VALUE: t: $domain - sit_0 \models$ ⟨ PERSON, t ⟩

The main point of interest is the condition ⟨ α-IND-SCOPING-POINT,'who', AT: 'Who likes Bill' ⟩. This is what forces α-binding of this variable by α-CLOSURE. If some other scopal specification had been given, the meaning description would be ruled out as incoherent, given the scopal restriction specified in the interrogative sentence rule.

A dislocation unary wh-interrogative sentence

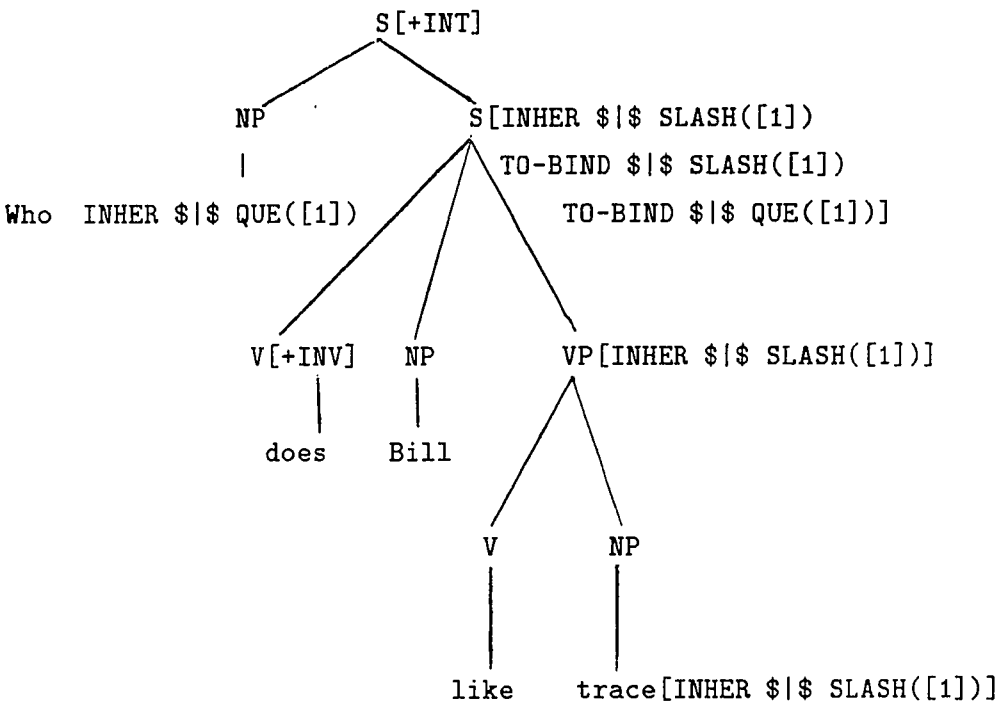
(599) a. Who does Bill like.

b. Skel-Cont: αs ⟨ λx ⟨ LIKE, subj-role:x,obj-role: s ⟩ x:b ⟩

(By the definition of α-binding, this is equivalent to:)

Skel-Cont: ⟨ λs ⟨ λ x ⟨ LIKE, subj-role:x,obj-role: s ⟩ x:b ⟩ s:- ⟩

In detail:



(600) a. [trace]($dis - sit_0$, 'who') = s,
CONDITIONS-ON-VALUE: ⟨ =, s, Skel-Cont('who') ⟩

b. ['like trace'] ($dis - sit_0$) = λx ⟨ LIKE, subj-role:x,obj-role: s ⟩
CONDITIONS-ON-VALUE: ⟨ = s, Skel-Cont('who')⟩

c. ['does Bill like trace']($dis - sit_0$) = ⟨ λ x ⟨ LIKE, subj-role:x,
obj-role: s ⟩ x: bill ⟩
CONDITIONS-ON-VALUE: ⟨ = s, Skel-Cont('who') ⟩

d. ['who']($dis - sit_0, domain - sit_0$) = s,
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ α-IND-SCOPING-POINT, 'who',
AT: 'Who does Bill like trace' ⟩; s: $domain - sit_0 \models$ ⟨ PERSON, s ⟩

e. ['who does Bill like trace']($dis - sit_0$) = αs ⟨ λx ⟨ LIKE, subj-role:x,
obj-role: s ⟩ x:**bill** ⟩;

CONDITIONS-ON-VALUE: s: $domain - sit_0 \models$ ⟨ PERSON, s ⟩; ⟨ =, s, Skel-Cont('who') ⟩

The main points to note are the conditions, ⟨ =, s, Skel-Cont('who') ⟩ and ⟨ α-IND-SCOPING-POINT,'who', AT: 'Who does Bill like trace' ⟩. The former identifies the content of the trace with that of the filler. The latter forces α-binding of this variable.

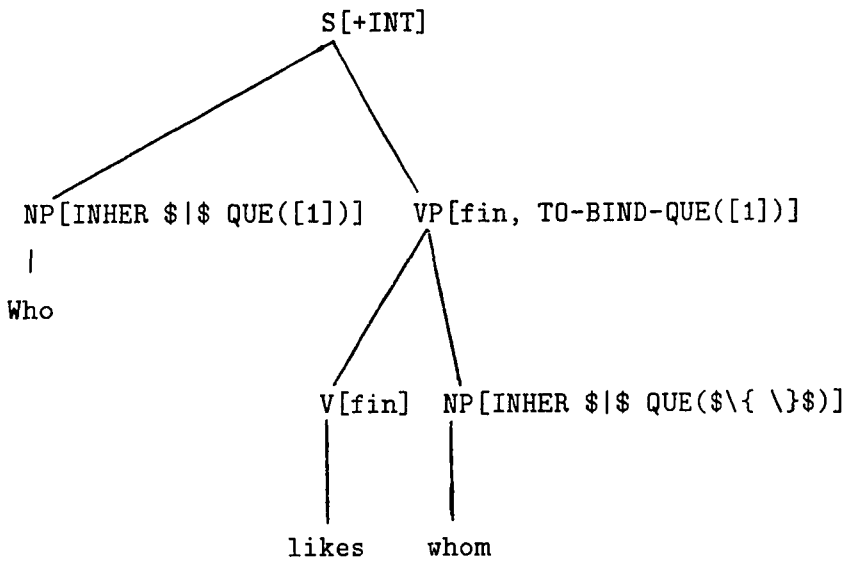
A multiple wh-interrogative sentence

(601) a. Who likes whom.

b. Skel-Cont: αs,t ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ comp-liker:s ⟩

(By the definition of α-binding, this is equivalent to:)

Skel-Cont: ⟨ λs,t ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:s ⟩ s:–,t:– ⟩



(602) a. ['whom']($dis - sit_0, domain - sit_1$) = t,
CONDITIONS-ON-VALUE: $dis - sit_0 \models \langle$ α-IND-SCOPING-POINT, 'whom',
AT: 'Who likes whom' $\rangle$; t: $domain - sit_1 \models \langle$ PERSON, t $\rangle$

b. ['likes whom'] ($dis - sit_0$) = λx $\langle$ LIKE, subj-role:x,obj-role: t $\rangle$

c. ['who']($dis - sit_0, domain - sit_0$) = s,
CONDITIONS-ON-VALUE: $dis - sit_0 \models \langle$ α-IND-SCOPING-POINT, 'who',
AT: 'Who likes whom' $\rangle$; s: $domain - sit_0 \models \langle$ PERSON, s $\rangle$

d. [who likes whom]($dis - sit_0$) = αs,t $\langle$ λx $\langle$ LIKE, subj-role:x,
obj-role: t $\rangle$ x:s $\rangle$;
CONDITIONS-ON-VALUE: s: $domain - sit_0 \models \langle$ PERSON, s $\rangle$; t: $domain$
$sit_1 \models \langle$ PERSON, t $\rangle$

The main point to note is the lack of strict scoping in this example between the two interrogative phrases. Both are scoped at the same level, though given the nature

of the binding and the interrogative content no special WHQI rule is required to do this.

6.4.4 'which phrases'

Meaning description

Just as we have taken the meaning descriptions of independent uses of 'who' and 'what' to be interrogative cousins of indefinite description expressions, we take 'which' phrases to be interrogative counterparts of *definite* description expressions. In so doing we get an immediate account of the uniqueness/salience effects displayed by such phrases, referred to in recent syntactic literature as its propensity for 'D-linking'.

(603) ['Which table']($dis-sit_0, uniqueness\ sit_0, absorption-point_0$) = t;
CONDITIONS-ON-VALUE: $dis-sit_0$ = ⟨ α-IND-SCOPING-POINT,'which table', AT: $absorption-point_0$ ⟩; t: $uniqueness-sit_0$ |= ⟨ TABLE, t ⟩; $uniqueness-sit_0$: ⟨ UNIQUE, TABLE, $uniqueness-sit_0$ ⟩

Notice that although the conditions in the meaning description will not ultimately lead to an existential quantification over tables, precisely the same uniqueness/salience condition applies as with a definite. This places an obligation on the speaker: even if she does not *know* that an entity satisfying the *queried* property exists, since she must be able to fix the uniqueness-situation parameter, this means that she knows that in that situation an entity satisfying the *restrictive* condition exists, and she *strongly suspects* that it, whatever or whoever it is, does satisfy the *queried* property. Hence, a query that uses such a question as its descriptive content must start from a considerably higher informational level than a corresponding question with 'who' or 'what'. Similarly, for the addressee: if he is not able to fix the resource situation, he must be aware that fixing it is required. Hence, while he may not be able to respond informatively, since he knows the rules of the language, he can abduce that the querier suspects strongly the existence of a unique entity satisfying the given property.

Bach Peters sentences

We can now make our first foray into Bach-Peters sentences. We will see what the source for the 'absolutely unique reading' of multiple interrogative sentences. In section (6.5), once we have acquainted ourselves with the *dependent* use, will we be able to understand various of the differences between quantifier/interrogative sentences and interrogative/interrogative sentences.

Let us provide a meaning description for the following sentence, which can only elicit independent responses:

(604) a. Which director who produced it backed out of which highly publicised movie that was causing him losses?

b. Coppola was the director, the movie was Hammett.

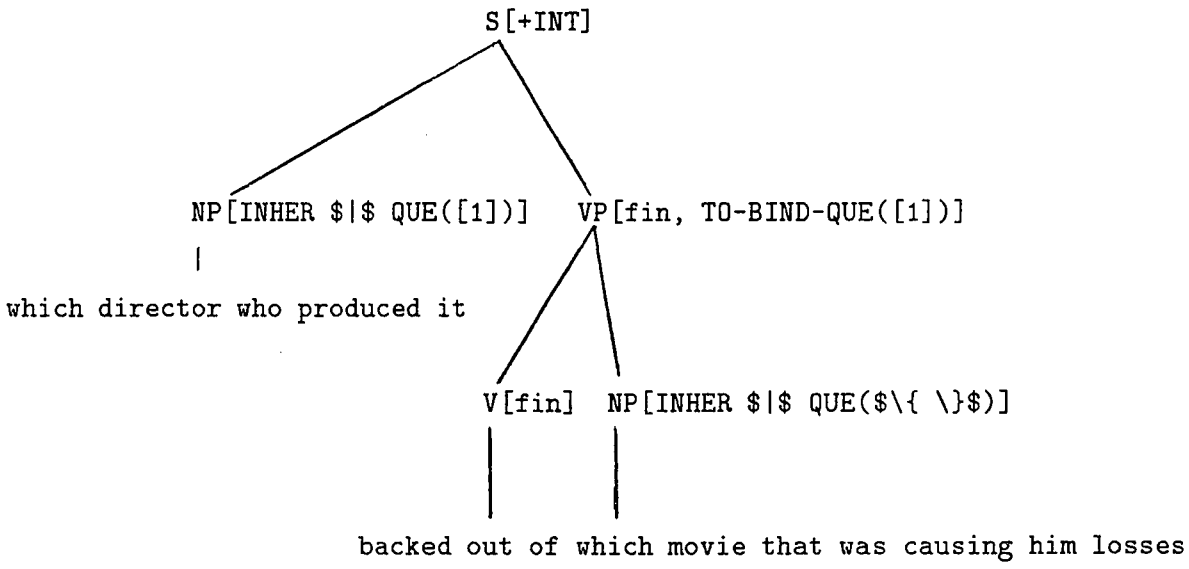
c. # Coppola (was the director who) backed out of Hammett, Ponti (was the director who) backed out of The Bicycle Thief,...

The main point to note is that given the fact that interrogatives here do not need to be quantified in, no paradoxical crossing arises. Schematically, the meaning that arises on a crossing coreference use is:

(605)

['Which director who produced it backed out of which movie that was causing him losses'](*dis* − sit_0) = αs,t ⟨ λx ⟨ BACKED-OUT, subj-role:x,obj-role: s ⟩ x:t ⟩
t: *uniqueness* − sit_1 ⊨ ⟨ λy(DIRECTOR-WHO-PRODUCED,s,y),t ⟩
s: *uniqueness* − sit_0 ⊨ ⟨ λz(MOVIE-CAUSING-LOSSES-TO, t,z), s ⟩

This meaning arises directly from the interrogative meanings we postulated.



We adopt here an abbreviatory convention of not repeating scopal specifications. We indicate anaphoric dependencies by placing conditions identifying pronoun variables with their antecedents.

(606) a. ['Which movie that was causing him losses'](*dis* − sit_0, *uniqueness* − sit_0, 'Which director...him losses') = s;
CONDITIONS-ON-VALUE: *dis*−sit_0 ⊨ ⟨ α-IND-SCOPING-POINT,'which movie that was causing him losses' AT: 'Which director...him losses' ⟩; s: *uniqueness*−sit_0 ⊨ ⟨ λz(MOVIE-CAUSING-LOSSES-TO, t,z), s ⟩; *uniqueness*−sit_0: ⟨ UNIQUE, λz(MOVIE-CAUSING-LOSSES-TO, t,z) *uniqueness*−sit_0 ⟩, *dis* − sit_0 ⊨ ⟨ =, 'him', Skel-Cont('which director who produced it') ⟩

b. ['backed out of which movie that was causing him losses'] (*dis* − sit_0) = λx ⟨ BACKED-OUT, subj-role:x,obj-role: s ⟩

c. ['Which director who produced it'](*dis* − sit_0, *uniqueness* − sit_1, 'Which director...him losses') = t;

CONDITIONS-ON-VALUE: $dis-sit_0 \models$ ⟨ *alpha*-IND-SCOPING-POINT,'which director who produced it' AT: Which director...him losses' ⟩; t: $uniqueness-sit_1 \models$ ⟨ λy(DIRECTOR-WHO-PRODUCED,s,y),t ⟩; $uniqueness - sit_1$: ⟨ UNIQUE, λy(DIRECTOR-WHO-PRODUCED,s,y) $uniqueness - sit_1$ ⟩, $dis - sit_0 \models$ ⟨ =, 'it', Skel-Cont('which movie that was causing him losses') ⟩

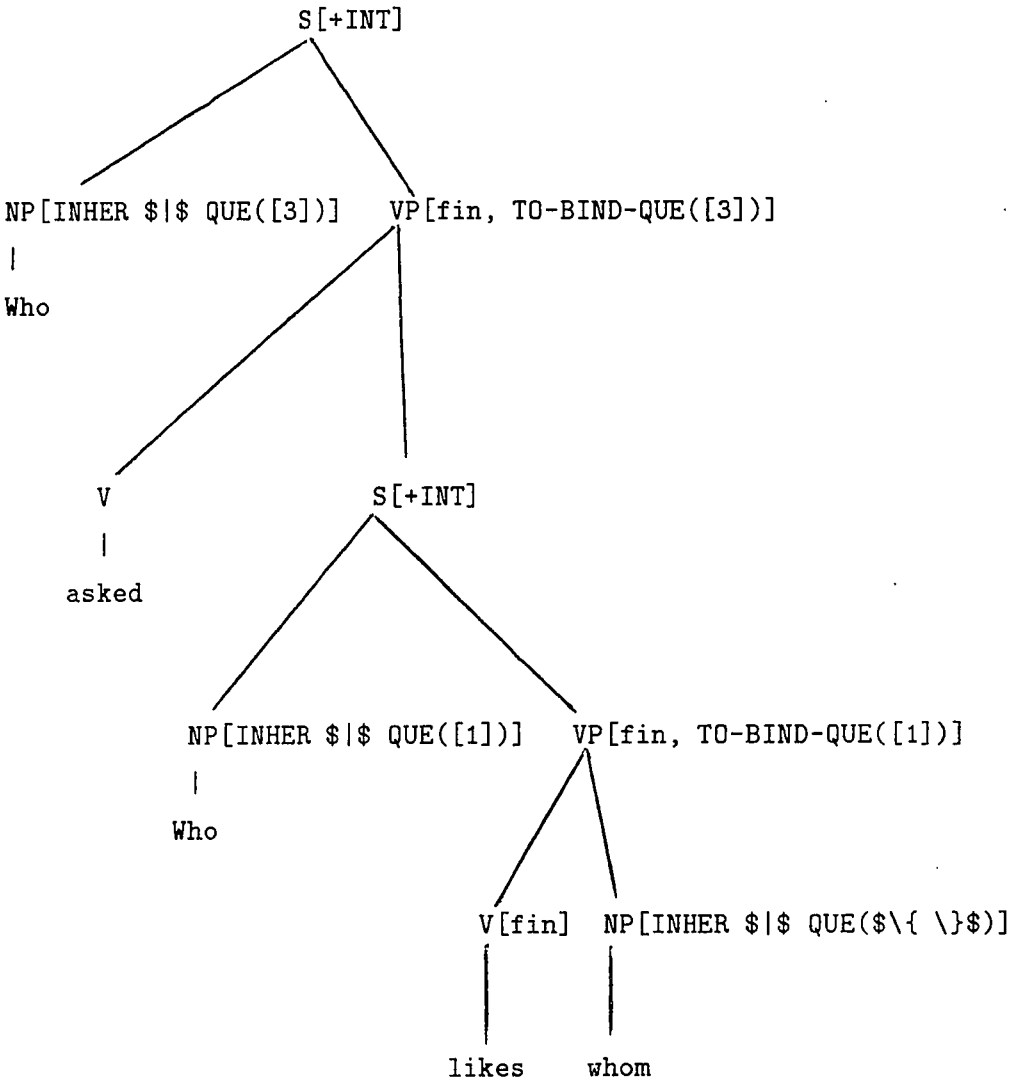
d. ['Which director who produced it backed out of which movie that was causing him losses'](*dis* − sit_0) = αs,t ⟨ λx ⟨ BACKED-OUT, subj-role:x,obj-role: s ⟩ x:t ⟩
CONDITIONS-ON-VALUE: t: $uniqueness-sit_1 \models$ ⟨ λy(DIRECTOR-WHO-PRODUCED,s,y),t ⟩; $uniqueness - sit_1$: ⟨ UNIQUE, $uniqueness - sit_1$ ⟩
s: $uniqueness - sit_0 \models$ ⟨ λz(MOVIE-CAUSING-LOSSES-TO, t,z), s ⟩; $uniqueness - sit_0$: ⟨ UNIQUE, λz(MOVIE-CAUSING-LOSSES-TO, t,z) $uniqueness - sit_0$ ⟩

6.4.5 Ambiguities in embedding

We move now to consider ambiguities that can arise in interrogative sentence embedding. The basic idea is that the scoping possibilities, just like other scopal ambiguities, are not *fixed* by the syntax. However, the syntax can act to *constrain* the scopal possibilities quite drastically. The advantage of an account of scope like the present one is that it transfers to cases where the existence of no syntactic embedding operator can be motivated, as is the case for reprise uses.

We consider the sentence

(607) Who asked who likes whom


S[+INT]
NP[INHER $|$ QUE([3])]
VP[fin, TO-BIND-QUE([3])]
Who
V
asked
S[+INT]
NP[INHER $|$ QUE([1])]
VP[fin, TO-BIND-QUE([1])]
Who
V[fin]
NP[INHER $|$ QUE($\{ \}$)]
likes
whom

The basic sentential complement rule we assume is the following:

(608) a. VP[fin] → (H, V[fin]), (C,S[fin])

b. [VP]($dis - sit_0$) = λx ⟨ Skel-Cont(V), subj-role:x,
obj-role: Skel-Cont(S) ⟩;
CONDITIONS-ON-VALUE: Restr-Cont(V) conjoined with Restr-Cont(NP).

The interrogative sentence rule imposes on the variable associated with the interrogative marked with QUE to be absorbed at that sentential level. Given the constraints we have assumed our imposed on the feature QUE, that it must be present in any interrogatory sentence and be leftmost, this ensures that solely one wh-phrase in a given sentence will be specified for QUE. Consider, then, our sentence above:

(609) Who asked who likes whom

Both subjects are forced to be specified for QUE and hence be absorbed at their respective sentential levels. However, the *in situ* interrogative phrase is free to be absorbed at either level. Schematically:

(610) a. α x⟨ ASK, asker:x, α y,z ⟨ LIKES, liker-er: y, likee:z ⟩; ⟩

b. α x,z⟨ ASK, asker:x, α y⟨ LIKES, liker:y, likee:z ⟩; ⟩

In what follows in this section, for perspicuity, we omit the descriptive conditions on the interrogative phrases. The first reading arises if the embedded interrogative has the following meaning description, whose derivation we saw in a previous section:

(611) [who likes whom]($dis - sit_0$) = αs,t ⟨ λx ⟨ LIKE, subj-role:x,
obj-role: t ⟩ x:s ⟩;
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ α-IND-SCOPING-POINT, 'who',
AT: 'Who likes whom' ⟩; $dis - sit_0$ |= ⟨ α-IND-SCOPING-POINT, 'whom', AT:
'Who likes whom' ⟩

The crucial factor is the α-IND-Scoping-Point specification for 'whom':

(612) $dis - sit_0 \models$ ⟨ α-IND-SCOPING-POINT, 'whom', AT: 'Who likes whom' ⟩

This forces the α-abstracting of t at the embedded level.

The second possible meaning this sentence can have will arise if 'whom' is specified with the following restriction:

(613) $dis - sit_0 \models$ ⟨ α-SCOPING-POINT,
'whom', AT: 'Who asked who likes whom' ⟩

The embedded meaning then arises as follows:

(614) a. ['whom']$(dis - sit_0, domain - sit_1)$ = t,
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ α-SCOPING-POINT, 'whom', AT: 'Who asked who likes whom' ⟩;

b. ['likes whom'] $(dis - sit_0)$ = λx ⟨ LIKE, subj-role:x,obj-role: t ⟩
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ α-SCOPING-POINT, 'whom', AT: 'Who asked who likes whom' ⟩;

c. [who]$(dis - sit_0, domain - sit_0)$ = s,
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ α-SCOPING-POINT, 'who', AT: 'Who likes whom' ⟩;

d. [who likes whom]$(dis - sit_0)$ = αs ⟨ λ x ⟨ LIKE, subj-role:x,
obj-role: t ⟩ x:s ⟩;
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ α-SCOPING-POINT, 'whom', AT: 'Who asked who likes whom' ⟩

The embedded sentence rule will then yield:

(615) a. ['asked who likes whom']$(dis - sit_0)$ = λx ⟨ ASK, asker:x,
asked-obj:αs ⟨ λ x ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:s ⟩;
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ α-SCOPING-POINT, 'whom', AT: 'Who asked who likes whom' ⟩

and given that the matrix subject has the following specification for this meaning:

(616) a. [who]($dis - sit_0, domain - sit_0$) = v,
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ α-SCOPING-POINT, 'who', AT: 'Who asked who likes whom' ⟩

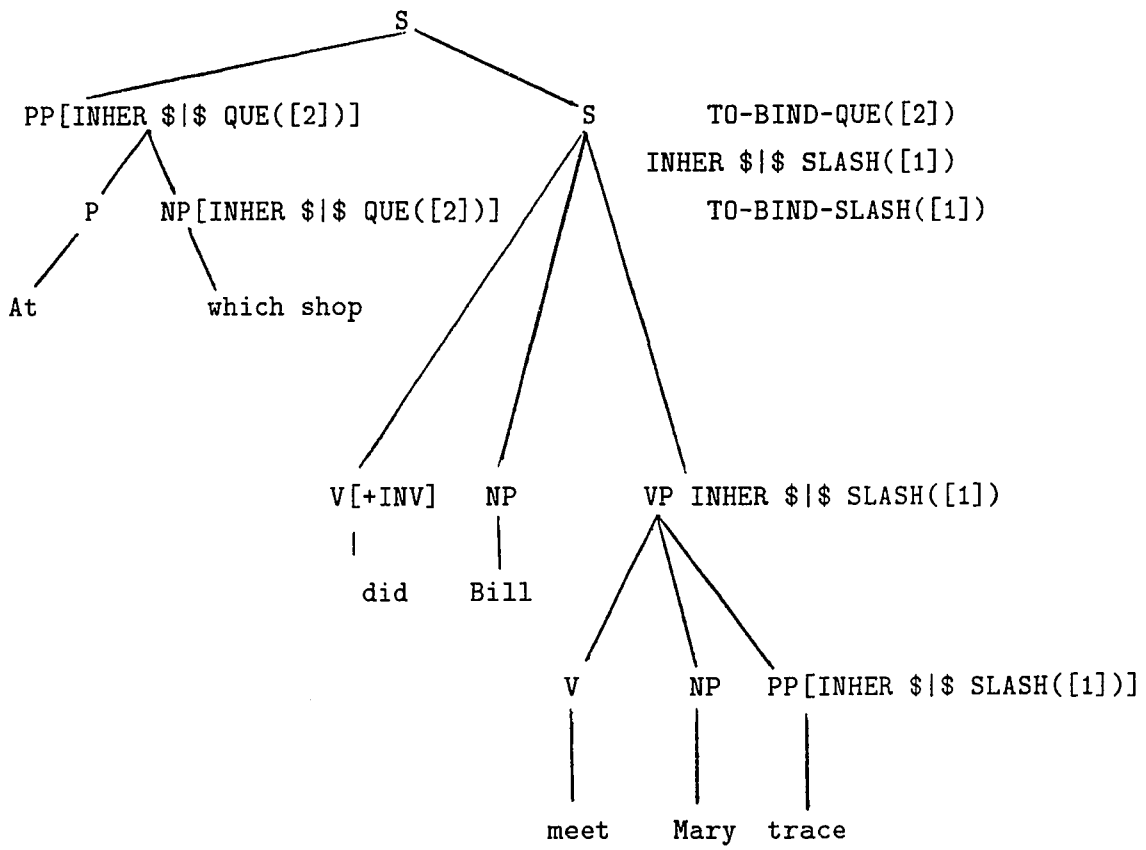
The full, resulting meaning will be:

(617) a. ['Who asked who likes whom']($dis - sit_0$) = αv,t⟨ λz ⟨ ASK, asker:z, asked-obj:α s ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:s ⟩;z:v ⟩

6.4.6 A pied piping example

We now show how pied piping works in the current approach:

(618) At which shop did Bill meet Mary



The point is that in such a case, there are two distinct dependencies. The SLASH dependency relates the trace to the entire dislocated phrase. The QUE dependency ensures that it is the variable introduced by the interrogative constituent of the whole dislocated phrase that gets α-closured. How does this work? 'which shop' is entered into the QUE store. The rule for interpreting interrogative sentences, dislocated or not, contains the additional restriction that the variable filling the argument role associated with a phrase marked QUE must be closured at that sentential level:

(619) 3 S[fin] → (H,S[fin, INHER—SLASH ([1]),..., TO-BIND | SLASH([1]), TO-BIND | QUE([2])]), (F,[1])

S $(dis - sit_0) = \alpha - CLOSURE($ Skel-Cont(H)
CONDITIONS-ON-VALUE: combine the Restr-Cont(H) with the Restr-Cont(F);
$dis - sit_0 \models \langle$ *alpha*-SCOPING-POINT, [2], AT: [3] $\rangle)$

Hence at the point where the QUE dependency is terminated, the variable filling the role associated with the QUE marked phrase is closured: in the case of the dislocated structure this is also where the SLASH dependency terminates, whereas in the case of a subject question, this is at the point where the subject is interpreted.

6.4.7 Meaning descriptions for alternative phrases

We now provide a sketch of a meaning description for (independent uses of) (constituent) alternative sentences.[13] The purpose is illustrative, enabling us to show how the uses we describe for wh-phrases, generalize to alternative phrases. In this spirit, then, we make a number of simplifying assumptions: we assume that alternative phrases are ambiguous syntactically, one form of which is used interrogatively. In actual use, it is intonation that disambiguates between an interrogative or 'normal' disjunction, though apparently in Finnish, different lexical items do exist (Karttunen 1977).

The meaning description we provide for a phrase like 'John or Bill' is identical to that of the wh-phrase 'Which of John or Bill', as was argued for in section (4.2.7).

(620) ['John or Bill']$(dis - sit_0, uniqueness - sit_0, absorption - point_0)$ = t;
CONDITIONS-ON-VALUE: $dis - sit_0 \models \langle$ α-IND-SCOPING-POINT,'John or Bill', AT: $absorption - point_0$ $\rangle$; t: $uniqueness - sit_0 \models \langle$ IDENTICAL-TO-(**john** or **bill**), t $\rangle$; $uniqueness - sit_0$: $\langle$ UNIQUE, IDENTICAL-TO-(**john** or **bill**), $uniqueness - sit_0$ $\rangle$

Given the data we provided in section (6.3), we assume alternative sentences cannot be embedded. Hence, the sentential rule we write is simply the interrogative rule we wrote for a declarative NP/VP adapted to an inverted sentence structure.

[13]Recall that in chapter 1, we argued that sentential alternative questions are disjoined yes-no questions.

(621) a. S[fin] → (H, (VP[+INV])), (C, NP[nom])

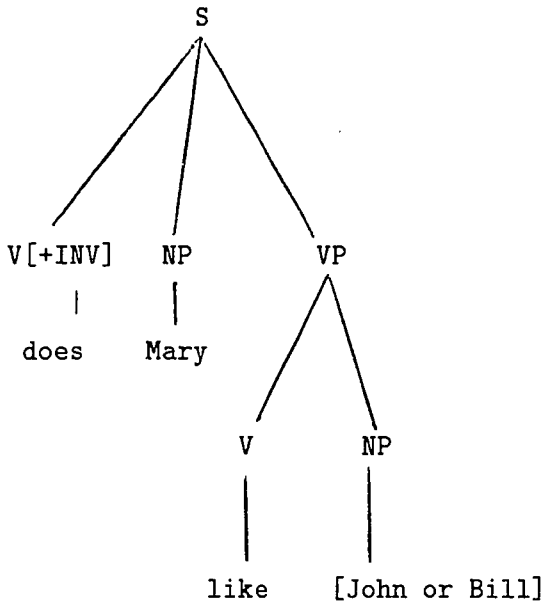
S $(dis - sit_0)$ = α-CLOSURE(QUANT-CLOSURE(⟨ Skel-Cont(VP), Skel-Cont(NP) ⟩))
CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP)

(622) a. Does Mary like John or Bill.

b. Skel-Cont: αt⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x: **mary** ⟩, WHERE
$uniqueness - sit_0 \models$ ⟨ IDENTICAL-TO-(**john** or **bill**), t ⟩

(By the definition of α-binding, this is equivalent to:)

Skel-Cont: ⟨ λ t ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x: **mary** ⟩ t:- ⟩
WHERE
$uniqueness - sit_0 \models$ ⟨ IDENTICAL-TO-(**john** or **bill**), t ⟩



(623) a. ['John or Bill']($dis - sit_0$, $uniqueness - sit_0$, 'Does Mary like John or Bill') = t;
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ α-IND-SCOPING-POINT,'John or Bill', AT: 'Does Mary like John or Bill' ⟩; t: $uniqueness - sit_0$ |= ⟨ IDENTICAL-TO-(**john** or **bill**), t ⟩; $uniqueness - sit_0$: ⟨ UNIQUE, IDENTICAL-TO-(**john** or **bill**), $uniqueness - sit_0$ ⟩

b. [like [John or Bill]] ($dis - sit_0$) = λx ⟨ LIKE, subj-role:x,obj-role: t ⟩
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ α-IND-SCOPING-POINT,'John or Bill', AT: 'Does Mary like John or Bill' ⟩; t: $uniqueness - sit_0$ |= ⟨ IDENTICAL-TO-(**john** or **bill**), t ⟩; $uniqueness - sit_0$: ⟨ UNIQUE, IDENTICAL-TO-(**john** or **bill**), $uniqueness - sit_0$ ⟩

c. [Does Mary like [John or Bill]]($dis - sit_0$) = α t⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x: **mary** ⟩

CONDITIONS-ON-VALUE: t: *uniqueness* – sit_0 |= ⟨ IDENTICAL-TO-(**john** or **bill**), t ⟩; *uniqueness* – sit_0: ⟨ UNIQUE, IDENTICAL-TO-(**john** or **bill**), *uniqueness* – sit_0 ⟩

6.5 Dependent uses of wh-phrases

6.5.1 Dependent uses of non-interrogatives

Definiteness, anaphoricity and uniqueness

The meaning we assigned interrogative phrases hitherto provides a strightforward account for the propensity of argument roles associated with interrogative expressions to take wide scope. In the case of *dependent* uses, this widest scope property of the individual argument role is undesirable. The issue, then, is this: is there any natural way of modifying independent use meaning in a way that will eliminate this scopal property of an interrogated argument role? We will show that an account concerning an analogous issue concerning definites, pronouns and other dependent elements transfers to the interrogative case.

Heim's theory of definiteness develops the idea that definiteness is none other than anaphoricity: a definite (is felicitous iff it) denotes an antecedently introduced filecard. While the theory is successful in explaining a variety of phenomena, it does run into a problem of accounting for perfectly felicitous uses of definites involving no antecedent. In order to get around this, Heim uses Lewis' notion of accommodation, so that any antecedent-less use of a definite is analysed as involving, as it were, an implicit antecedent, whose existence must be inferred in order to make the use felicitous. The problem such a strategy brings with it, acknowledged by Heim, is that in the absence of a *theory* of accommodation, it is hard to decide when such an antecedent can be assumed to exist and when it cannot.

Gawron and Peters 1990a refine Heim's theory: their idea is to start out with the (traditional) view of definiteness as involving *uniqueness* in a given domain. Thus, one possible use of a definite expression such as a definite description is to refer to an entity, uniquely satisfying the description in a contextually given domain. Pronouns,

similarly, can be used deictically to pick out a male/female/neuter/possessee unique in a given domain. But such a theory runs into problems if nothing further is said:

(624) Every dog wagged its tail

The most plausible use of (624) is *not* to assert that all dogs in a given domain possessed the ability to wag the tail possessed by a unique (miserable) canine in some, perhaps different domain. Rather, it asserts that every dog wagged its *own* tail. But, this content cannot emerge from the theory of definiteness sketched hitherto, since the uniqueness it provides for is absolute, rather than relative to each dog. And, as we saw in (555), repeated here as (625), the uniqueness will not disappear, even if the definite undergoes existential closure, so long as its uniqueness/salience situation is a parameter of the meaning description:

(625) Jill didn't see the table.

It is at this point that Heim's important insight about the link between definiteness and anaphoricity is brought to bear. Gawron and Peters' idea is to weaken Heim's condition from 'Definites must be anaphoric.' to 'Definites *can be* anaphoric.' That is, definites have an *additional* non-referential/quantificational use, which makes use of the same mechanisms of bound variable anaphora: it is used to merge two argument roles. Or, in the language of variables, the discourse marker corresponding to the use of the definite is constrained to be identical to some other discourse marker in whose scope it lies. In order to see how this solves the problem, we need to make a digression involving situation theory.

Dependence and the Absorption principle

If we incorporate an anaphoric condition to a referential use of a possessive pronoun, we obtain the following:

(626) ['its tail'] $(dis - sit_0, role - antecedent_0) = s$;
CONDITIONS-ON-VALUE: s: ⟨ TAIL, s ⟩, ⟨ POSSESSION, poss-er:t,poss-ee:s ⟩; t: $uniqueness - sit_0 \models$ ⟨ INANIMATE, t ⟩; $uniqueness - sit_0$

UNIQUE, INANIMATE, $uniqueness - sit_0 \rangle \langle \models uniqueness - sit_0 \langle =$, t, $role - antecedent_0 \rangle \rangle$

Note that the uniqueness-situation has not been specified as a parameter of the meaning. This means it has to get quantified away at some point. How? The basic cause for this will be that some other variable it is *dependent* upon, the *antecedent*, is also not a parameter of this meaning. In order to see how this happens systematically, let us first introduce the notion of *dependence*.

A variable x that is a constituent of a meaning description will be said to be dependent on another variable y if y occurs in a condition restricting x. In the case of (626):

- s is dependent on t.
- $uniqueness - sit_0$ is dependent on t and on role-antecedent$_0$
- t depends on $uniqueness - sit_0$

With the notion of dependence at hand, we can state a logical principle, postulated by Gawron and Peters to hold of Situation Theory, which they call the **Absorption principle**. They formulate it as:

> If x is a parameter of some object o, then every parameter that x depends on is a parameter of o.

The import of this in variable-speak is:

> No objects contain free variables dependent on bound variables.

Which can be stated positively:

> If y depends on x and x has been absorbed (i.e. abstracted over or existentially quantified away), then y must be existentially quantified away.

What this is supposed to rule out are relations of the following schematic form

(627) λx $\langle$ T ... $y_{\langle R,y,x,\rangle}$... $\rangle$

A relation in accordance with the absorption principle and differing minimally from the above would be:

(628) λx $\exists$y $\langle$ T ... $y_{\langle R,y,x,\rangle}$ $\rangle$

The primary motivation for the Absorption principle is logical: it is needed by a system utilising restrictions on variables and abstraction: restrictions are intended as further conditions on anchorings or assignments of values to the variables.[14] The problematic aspect introduced by allowing a relation of the type depicted in (627) to exist is, schematically this: call the relation depicted in (627) T, y is free in T, but any assignment of a value to y has to satisfy the restriction imposed on it, which in turn contains x. x, however, is not free in T, so there is no sensible way to construe such an assignment. The absorption principle can be viewed as a hygiene-maintaining axiom of situation theory. For further discussion of the logical status of this principle, see the appendix of Gawron and Peters 1990a.

Gawron and Peters go on to argue that the absorption principle makes various linguistic predictions concerning anaphora, ellipsis and scope, the latter which we will come to shortly. For further detail on this, see Gawron and Peters 1990a and Gawron and Peters 1991.

Anaphoric definites

We can now return to explain how incorporating Heim's insight on the anaphoric nature of definites into a more traditional view of definites as carrying a uniqueness presupposition can lead to a use where the uniqueness is lost, or rather relativised.

Consider the sentence

(629) Every dog wagged its tail.

This one sentence has two meanings, depending on the use to which the expression 'its tail' is put. Any use of the sentence according to the deictic use of 'its tail' provides for reference to the unique possessor of the tail, as indeed to the tail. Schematically:

[14]In terms of argument roles: regulate appropriateness restrictions on argument roles.

(630) ['Every dog wagged its tail.'](*dis−sit*$_0$) =⟨ EVERY, DOG, λx ⟨ λz ⟨ WAG,wagger:z, wagged:s ⟩ z:x ⟩ ⟩;
CONDITIONS-ON-VALUE: s: ⟨ TAIL, s ⟩, ⟨ POSSESSION, poss-er:t,poss-ee:s ⟩; t: *uniqueness−sit*$_0$ |= ⟨ INANIMATE, t ⟩ *dis−sit*$_0$ |= ⟨ REFERRED-TO,'its tail', t ⟩; *uniqueness − sit*$_0$: ⟨ UNIQUE, INANIMATE,*uniqueness − sit*$_0$ ⟩

What changes when 'its tail' is used anaphorically to the argument *role* that gets projected by abstraction to form the subject role? It is that the reference relation is replaced by the condition

(631) ⟨ |=, *uniqueness − sit*$_0$ ⟨ DEPENDENCY, =, 'its tail', ['wagger', WAG] ⟩ ⟩

For notational perspicuity, we abbreviate DEPENDENCY facts using the variable covering the antecedent role, as follows: ⟨ =, t, z ⟩

Imposing the dependency has a cascading effect: causing both *uniqueness − sit*$_0$ and *s* to be dependent on *z*. By the Absorption principle, this forces these two variables to be existentially quantified away, providing the following Skel-Cont:

(632) ⟨ EVERY, DOG, λx ⟨ λz ∃*s*∃*uniqueness − sit*$_0$ ⟨ WAG,wagger:z, wagged:s ⟩ z:x ⟩ ⟩

The point is that *uniqueness − sit*$_0$ and *s* are no longer free in the meaning description, but depend on the subject argument. Hence the uniqueness that applies to the entity *s* that is a tail in *uniqueness − sit*$_0$ is not absolute, but is relative to every dog, the desired result.

(633) ['Every dog wagged its tail.'](*dis−sit*$_0$) = ⟨ EVERY, DOG, λx ⟨ λz ∃*s*∃*uniqueness−sit*$_0$ ⟨ WAG,wagger:z, wagged:s ⟩ z:x ⟩ ⟩
CONDITIONS-ON-VALUE: s: ⟨ TAIL, s ⟩, ⟨ POSSESSION, poss-er:t,poss-ee:s ⟩; t: *uniqueness − sit*$_0$ |= ⟨ INANIMATE, t ⟩
uniqueness−sit$_0$: ⟨ UNIQUE, INANIMATE, *uniqueness−sit*$_0$ ⟩ ⟨ |=, *uniqueness−sit*$_0$ ⟨ =, t, z ⟩ ⟩

Thus, certain of the examples discussed in 3.1.1 could be accommodated in the grammar, along the lines sketched by Partee 1989, by assuming such expressions have two types of use: one deictic/referential and the other *dependent.*[15]

On the line taken here this amounts to the following: We assume that the dependence introducing expression makes available a functional dependence $D(x, y)$. In the deictic case, the descriptive condition $D(x, y)$ is used to pick out an entity satisfying the description, relative to some contextual fixing of the independent variable. In the dependent use, $D(x, y)$ is utilised to establish a functional dependence between argument roles: *dependent* uses arise when the deictic use condition is replaced by the following condition added to the restrictions on the uniqueness situation parameter:

(634) $\langle \models uniqueness - sit_0 \langle$ DEPENDENCY, =, t, $role - antecedent_0 \rangle \rangle$

As long as the variable corresponding to the dependent expression lies within the scope of variable covering the argument role that gets projected to the antecedent, this will force the absorption of the dependent variable and its uniqueness situation to take place.

(635) a. ['a local bar'] $(dis - sit_0, uniqueness - sit_0)$ = s;
CONDITIONS-ON-VALUE: $dis - sit_0 \models \langle$ REFERRED-WITH, 'a local bar', s $\rangle$, s: $\langle$ BAR, s $\rangle$, $\langle$ LOCAL-TO, location:t, pred-obj:s $\rangle$; t: $uniqueness - sit_0 \models \langle$ LOCATION, t $\rangle$; $uniqueness - sit_0$: $\langle$ UNIQUE, LOCATION, $uniqueness - sit_0 \rangle$

b. ['a local bar'] $(dis - sit_0, role - antecedent_0)$ = s;
CONDITIONS-ON-VALUE: s: $\langle$ BAR, s $\rangle$, $\langle$ LOCAL-TO, location:t, pred-obj:s $\rangle$; t: $uniqueness - sit_0 \models \langle$ LOCATION, t $\rangle$; $uniqueness - sit_0$: $\langle$ UNIQUE, LOCATION, $uniqueness - sit_0 \rangle$ $\langle \models uniqueness - sit_0, \langle$ =, t, $role - antecedent_0 \rangle \rangle$

[15]Conceivably, some examples cannot be analysed this way and involve a dependent use with no antecedent, as Partee suggests, just as in sluicing. We leave those cases aside in the current work.

6.5.2 The Dependent use of interrogative phrases

As we have seen interrogatives also have a use which is 'non-deictic': an interrogative can be used to *specify* a dependency. We recall that the specification can involve a dependency between argument roles corresponding to an antecedent and the interrogative, but need not, as sluicing serves to remind us. In the current work, we restrict ourself to an account covering dependent uses involving dependence between roles, leaving the more general treatment to future work. The same basic mechanisms that regulate dependent uses of non-interrogatives apply here, in particular the absorption principle.

The same basic principle of interrogative independent uses applies: a variable fills the argument role associated with the interrogative phrase. However in dependent uses the idea is not that that argument role remain parametrised and create a new complex argument role. Rather, the idea is to create a SOA with an unresolved role for a dependency, constrained to relate the argument role associated with the interrogative and some other argument role(s). The absorption principle ensures that the interrogative argument role does not get scope wider than its antecedent role for the same reason as in the non-interrogative case, as we will see. The same closure mechanism applied to independent uses will, with slight revision, apply here to create interrogative contents, constrained by the same syntactic restrictions on scope.

Consider first the following independent use:

(636) ['Which tail did every dog wag'](*dis* − sit_0) = αs ⟨ EVERY, DOG(x), λx ⟨ λz ⟨ WAGGED,wagger:z, wagged:s ⟩ z:x ⟩ ⟩
CONDITIONS-ON-VALUE: *dis* − sit_0 |= ⟨ α-IND-SCOPING-POINT,'which tail', AT: 'which tail did each dog wag' ⟩; s: *uniqueness* − sit_0 = ⟨ TAIL,s ⟩
uniqueness − sit_0: ⟨ UNIQUE, TAIL,*uniqueness* − sit_0 ⟩

Notice, then, that in this case, *uniqueness* − sit_0 is a parameter of the meaning description, ensuring that whether or not some tail was actually *wagged* in *uniqueness* − sit_0, there was a unique tail involved.

What changes when 'which tail' is used dependently on the subject role associated with 'each dog'? It is that a dependency condition is imposed on the interrogated role.

just as on roles associated with non-interrogative dependently usable expressions, and the α-Scoping-Point restriction on s is dropped. Schematically,

(637) $\langle \models domain - sit_0 \langle =, \mathbf{h}(z), s \rangle \rangle$

This has a cascading effect: causing both $uniqueness - sit_0$ and s to be dependent on z. By the Absorption principle, this forces these two variables to be existentially quantified away, providing the following schematic meaning description:

(638) ['Which tail did every dog wag']$(dis - sit_0) = \alpha h \langle$ EVERY, DOG(x), $\lambda x \langle \lambda z$ $\exists s \exists uniqueness - sit_0 \langle$ WAGGED,wagger:z, wagged:s $\rangle$ z:x $\rangle \rangle$
CONDITIONS-ON-VALUE: s: $uniqueness - sit_0 \models \langle$ TAIL,s $\rangle$ $uniqueness - sit_0$: $\langle \models, uniqueness - sit_0 \langle =, h(z), s \rangle \rangle$

So, the effect of the dependence condition has been this: it has forced the individual interrogative variable to be absorbed and leaves the functional dependence as the interrogative variable free to be α-closured, and hence create an unresolved role for a dependency.

6.5.3 Describing dependent uses

We assume that whether an interrogative gets used independently or dependently is a contextual matter i.e. not **determined** by syntactic ambiguity, though the syntax will constrain the possibilities given the scoping possibilities between roles. In the former case, the meaning description specifies the scope of the interrogated argument role through an α-IND-SCOPING-POINT fact. In the latter case, the meaning description specifies the role antecedent and the scoping point of the dependency.

Thus, consider the following meaning description for a dependent use of 'which table':

(639) ['Which table']$(dis - sit_0, domain - sit_0, absorption - point_0,$
$role - antecedent_0) = t;$
CONDITIONS-ON-VALUE: $dis - sit_0 \models \langle \alpha$-DEP-SCOPING-POINT, 'which table' AT: $absorption - point_0 \rangle$ t: $uniqueness - sit_0 \models \langle$ TABLE, t $\rangle$; $uniqueness$

sit_0: ⟨ UNIQUE, TABLE, $uniqueness - sit_0$ ⟩, ⟨ $\models$, $uniqueness - sit_0$ ⟨ DEPENDENCY, h, 'which table',
$role - antecedent_0$ ⟩ ⟩

Two main points have changed here from the independent use. The first is the addition of the dependency restriction on the uniqueness-situation (or the domain situation in the case of an interrogative such as 'who'). The second concerns the scope condition: we refine our definition of α-Closure to accommodate the α-abstraction of the dependency. The absorption principle ensures the absorption of the individual variable at the same level as the variable covering the role antecedent.

The refined definition of α-CLOSURE:

(640) α-CLOSURE$(A_0, \sigma) = \alpha P(a_1), \ldots, P(a_n)\sigma$, where $a_1, \ldots, a_n$ is the longest sequence of NP sub-utterances of A_0 such that for any i, EITHER ⟨ α-IND-SCOPING-POINT, a_i, AT: A_0 ⟩ and $P(a_i)$ = Skel-Cont(a_i)
OR ⟨ α-DEPENDENT-SCOPING-POINT, a_i AT:A_0 ⟩ and
$\exists$ z⟨ DEPENDENCY, $P(a_i)$, a_i, z ⟩

For notational perspicuity, we abbreviate DEPENDENCY facts using the Skel-Cont of the interrogative, as follows: ⟨ =, t, h($role - antecedent_0$) ⟩

Consider first the sentence:

(641) Which table does each person like.

This gets the following schematic meaning:

(642) αh ⟨ EACH, PERSON, ⟨ λx ⟨ λz $\exists$ s $\exists$ $uniqueness - sit_0$ ⟨ LIKE, subj-role:z,obj-role: s ⟩ z:x ⟩
CONDITIONS-ON-VALUE: s: $uniqueness - sit_0$ $\models$ ⟨ TABLE, s ⟩; $uniqueness - sit_0$: ⟨ $\models$, $uniqueness - sit_0$ ⟨ =, h(z), s ⟩ ⟩

The main features distinguishing this content from an independent use of 'which table' are:

- The individual interrogative variable is not α-closured, but absorbed at the scope of the antecedent variable. This follows from the absorption principle given the dependence $\langle$ =, h(z), s $\rangle$.

- The uniqueness-situation is not a parameter of the meaning description. This follows for the same reason, namely that $uniqueness - situation_0$ is dependent on z and s, both of which get absorbed. Hence, the uniqueness presupposition concerning TABLE is only relative to each man: h relates each man to the unique table he likes.

- The content provides for an unresolved SOA, with an unresolved role for a dependency:

(643) $\langle$ λh $\langle$ EACH, PERSON,
$\langle$ λx $\exists$ s $\exists$ $uniqueness - sit_0$ $\langle$ λx $\langle$ LIKE, subj-role:z,
obj-role: h(z) $\rangle$ z:x $\rangle$ h:–$\rangle$

In detail:

(644) a. [trace]($dis - sit_0$, 'which table') = t,
CONDITIONS-ON-VALUE: $\langle$ =, t, Skel-Cont('which table') $\rangle$

b. [like trace] ($dis - sit_0$) = λz $\exists$t $\exists$ $uniqueness - sit_0$ $\langle$ LIKE, subj-role:z,obj-role: t$\rangle$
CONDITIONS-ON-VALUE: $\langle$ = t, Skel-Cont('which table')$\rangle$

c. [does each person like trace]($dis - sit_0$) = $\langle$ λz $\exists$ t $\exists$ $uniqueness - sit_0$ $\langle$ LIKE, subj-role:z,obj-role: t $\rangle$ z:x $\rangle$
CONDITIONS-ON-VALUE: $\langle$ = t, Skel-Cont('which table') $\rangle$ $\langle$ Scoping-Point, 'each man', 'which table does each man like' $\rangle$

d. ['Which table']($dis - sit_0, domain - sit_0$, 'which table does each person like', [subj-role, 'like']) = t;
CONDITIONS-ON-VALUE: $dis{-}sit_0 \models \langle$ α-DEP-SCOPING-POINT, 'which

table' AT: 'which table does each person like' ⟩ t: $uniqueness - sit_0 \models$ ⟨ TABLE, t ⟩; $uniqueness - sit_0$: ⟨ UNIQUE, TABLE, $uniqueness - sit_0$ ⟩, ⟨ $\models$, $uniqueness - sit_0$ ⟨ =, h([subj-role,'like']),t ⟩ ⟩

e. ['which table does each person like']($dis - sit_0$) = αh ⟨ EACH, PERSON, ⟨ λx ⟨ λz $\exists$ t $\exists$ $uniqueness - sit_0$ ⟨ LIKE, subj-role:z,obj-role: t ⟩ z:x ⟩ CONDITIONS-ON-VALUE: t: $uniqueness - sit_0 \models$ ⟨ TABLE, t ⟩; $uniqueness - sit_0$: ⟨ UNIQUE, TABLE, $uniqueness - sit_0$ ⟩ ⟨ $\models$ $uniqueness - sit_0$ ⟨ =, h(z),t ⟩ ⟩

The crucial point in the meaning description is where the VP is formed: since the trace is constrained to be identical in **content** to the filler and the latter is dependent on the subj-role of 'like', this forces the absorption of the individual interrogative and the uniqueness-situation variables.

Notice that nothing here depended on the scopal nature of the subject, so entirely analogous considerations will lead to the following meaning description for sentences with non-quantificational or interrogative subjects:

(645) a. Which table do Ryan Giggs, Mark Hughes and Brian McClair like.

b. αh ⟨ ⟨ λz $\exists$ s $\exists$ $uniqueness - sit_0$ ⟨ LIKE, subj-role:z,obj-role: s ⟩ z:**Ryan Giggs, Mark Hughes and Brian McClair** ⟩ CONDITIONS-ON-VALUE: s: $uniqueness - sit_0 \models$ ⟨ TABLE, s ⟩; $uniqueness - sit_0$: ⟨ $\models$, $uniqueness - sit_0$ ⟨ =, h(z), s ⟩ ⟩

(646) a. Which person liked which table.

b. αh,x ⟨ ⟨ λz $\exists$ s $\exists$ $uniqueness - sit_0$ ⟨ LIKE, subj-role:z,obj-role: s ⟩ z:x ⟩ CONDITIONS-ON-VALUE: s: $uniqueness - sit_0 \models$ ⟨ TABLE, s ⟩; $uniqueness - sit_0$: ⟨ $\models$ $uniqueness - sit_0$ ⟨ =, h(z), s ⟩ ⟩ x: $uniqueness - sit_1 \models$ ⟨ PERSON, x ⟩; $uniqueness - sit_1$: ⟨ UNIQUE, PERSON $uniqueness - sit_1$ ⟩

This latter example illustrates why uniqueness can be relativised, rather than absolute in multiple 'which' sentences. By the definition of α-binding, any use of the above sentence makes available an unresolved SOA of the following kind:

(647) ⟨ λ h,x ⟨ ⟨ λz ∃ s ∃ *uniqueness* − sit_0 ⟨ LIKE, subj-role:z,
obj-role: h(z) ⟩ z:x ⟩ x:−, h:−⟩

Since the object variable and its uniqueness-situation have to be quantified away, the property any filler of the role specified by the subject interrogative depends on the dependency specified by the role for dependency. Different resolutions of that dependency will yield potentially different resolutions of the filler of the unresolved subject slot. So, responses to such questions can provide a single filler and a dependency, or if they are exhaustive, multiple fillers and dependencies. The prediction is that for any dependency provided, there will be a unique filler. In other words, if a pair-list is provided, it represents an exhaustive response conveying pairs of entities and dependencies uniquely associated with them. Since, as we have argued in detail in chapter 1, exhaustiveness is a pragmatic need, the tendency to be exhaustive and provide a pair-list in such cases is weaker than it is when the pair-list serves to specify a dependency.

(648) a. (What's the latest in Hollywood:) Which director is proud of which one of his most recent movies?

b. Coppola is proud of his latest movie. Let's see who else? Oh, Scorcese is proud of his least profitable movie,...

(649) a. (Tell us the latest, a rough night on the ice, huh?:) Which skater missed which one of her jumps?

b. Ito missed the first jump she tried. In addition, Harding missed the one she usually has problems with.

As we shall now see, there are readings for multiple-wh-sentences that do not and in some cases cannot involve dependent uses.

6.5.4 Disjunctive contexts

The first case is a simple one concerning what we called disjunctive contexts. We noted in section (5.1) that multiple wh-sentences used in such contexts do not naturally

elicit pair-list responses, whereas in the same contexts unary wh-questions containing quantifiers *are* preferably responded to with pair-lists.

(650) a. (Context: It is known that Cal phoned Ann or Ann phoned Cal.) Who phoned whom?

b. (Same context:) Who did each person phone?

(651) a. Well, it's Cal who phoned Ann.

b. Cal phoned Ann, while Ann phoned Zhang.

The most natural way to explain the difference is that in the former sentence both wh-phrases are being used *independently*, both queried roles have wide scope and are focussed. Schematically:

(652) αx,y $\langle$ λz $\langle$ PHONED, phoner:z, phoned:y $\rangle$ z:x $\rangle$

The quantifier/interrogative sentence can be used in such a context either with an independent use, in which case one or more persons who were phoned up are sought, distinct from the meaning sought in the double-independent use of the multiple sentence. Alternatively, the wh-phrase can be used dependently on the **phoner** role, in which case a pair-list response is a natural one. This is also distinct from the double-independent use.

6.5.5 Quantifier/Interrogative asymmetries in Bach-Peters sentences

Recall the data presented in section (4.2.6) concerning crossed readings in Bach Peters sentences.

- Crossed readings in multiple-which sentences are available and do not elicit pair-list responses. The possibilities of a pair-list response are *not* improved substantially if the pronominal dependency present on the object interrogative is removed.

- In quantifier/interrogative Bach-Peters sentences, a crossed dependency reading is unavailable. On the other hand, if the pronominal dependency present on the interrogative is removed, a pair-list response becomes available.

Accounts that subsume interrogatives and nominal quantifiers under a common quantificational rubric find this asymmetry problematic to handle, if they have an account of the availability of crossed readings available in the first place. Whatever mechanism is adduced to license crossed readings in one case would appear to be available in the other.

The current account provides for a clear asymmetry. Consider first multiple 'which sentences':

(653) a. Which director who produced it backed out of which highly publicised movie that was causing him losses?

b. Coppola was the director, the movie was Hammett.

c. # Coppola (was the director who) backed out of Hammett, Ponti (was the director who) backed out of the bicycle thief,...

Given the uniqueness condition associated with 'which', the only possibility for a pair-list response in a multiple which sentence is if the object 'which phrase' gets a dependent use, an example of which we saw above. However, if this is to occur, the following dependence condition is imposed:

(654) $\langle \models uniqueness - sit_0 \langle =, \text{h(role-antecedent}_0), \text{s} \rangle \rangle$

Hence, the individual variable of the object 'which phrase' is forced to be absorbed at the VP level:

(655) $\lambda z\ \exists s\ \exists\ uniqueness - sit_0 \langle$ BACKED-OUT, subj-role:z,obj-role: s $\rangle$

Hence s is unavailable to scope out for an anaphoric use of 'it' in the restrictive condition on the subject. Hence a crossed reading cannot occur with a dependent use of the object 'which-phrase'. Since nothing in this discussion so far mentioned the restrictive condition on the *object* 'which phrase', eliminating it should not, in principle, change the possibilities for crossed readings:

(656) a. Which director who produced it backed out of which highly publicised movie?

b. Coppola was the director, the movie was Hammett.

c. # Coppola (was the director who) backed out of Hammett, Ponti (was the director who) backed out of the bicycle thief,...

Consider now the quantifier/interrogative case. A crossed reading must correlate with a non-independent use of the interrogative if there is to be a dependency between the quantified role and the interrogative role. This seems to be unavailable: in order to get rid of the absolute uniqueness on the 'which phrase', its uniqueness-situation parameter must be absorbed via a dependent reading. But then, the widest scope which the individual interrogative variable can be absorbed with is the nuclear scope of the quantifier and hence it is unavailable for anaphora in the restrictive term. So, the 'it' in the restrictive term on the interrogative has to be deictic:

(657) a. Which director who produced it backed out of each highly publicized movie that was causing him losses?

b. Coppola.

c. # Coppola backed out of Hammett, Ponti backed out of the bicycle thief,...

The following is a schematic content of a dependent use showing that s has been bound at the nuclear scope which means the s in the restrictive term:

(658) αh ⟨ EACH, λy MOVIE-CAUSING-LOSSES(y,t),
λx $\exists$ s, $uniqueness - sit_0$ ⟨ λz ⟨ BACKED-OUT, backer-out:z, backed-out-from: x ⟩ z:s ⟩ ⟩
CONDITIONS-ON-VALUE: s: $uniqueness - sit_0$ $\models$ ⟨ λv DIRECTOR-THAT-PRODUCED(v,x), s ⟩

The same account transfers to predict the unavailability of a dependent use with binding of the pronoun by the interrogative in:

(659) a. Which director backed out of each highly publicized movie that was causing him losses?

b. Coppola.

c. # Coppola backed out of Hammett, Ponti backed out of the bicycle thief,...

However, if the second restrictive condition is dropped, a dependent use with 'it' bound by the quantifier can arise since the individual interrogative variable is not required to be free at the restrictive term level:

(660) a. Which director who produced it backed out of each highly publicized movie?

b. Coppola.

c. Coppola was the director who backed out of Hammett, Ponti was the director who backed out of the bicycle thief,...

6.5.6 Dependent uses of alternative phrases

The account we provided transfers directly to alternative phrases, given that *in situ* interpretation requires no special mechanisms.

The meaning description for a dependent use of [John or Bill] involves as with wh-phrases the addition of the dependency restriction on the uniqueness/domain situation parameter, and a α-DEP-SCOPING-POINT condition:

(661) a. ['John or Bill']($dis - sit_0, uniqueness - sit_0$, $absorption - point_0$, $role - antecedent_0$) = t;
CONDITIONS-ON-VALUE: $dis{-}sit_0 \models \langle$ α-DEP-SCOPING-POINT, '[John or Bill]', AT: $absorption{-}point_0 \rangle$ t: $uniqueness{-}sit_0 \models \langle$ IDENTICAL-TO-(**john** or **bill**), t $\rangle$ $uniqueness - sit_0$: $\langle$ UNIQUE, IDENTICAL-TO-(**john** or **bill**), $uniqueness - sit_0 \rangle$, $\langle \models, uniqueness - sit_0 \langle =$, h($role - antecedent_0$). t $\rangle \rangle$

This will yield the following schematic meaning description:

(662) a. Does each person (here) like [John or Bill].

b. αh ⟨ EACH, PERSON(x), ⟨ λx ⟨ λz $\exists$ s $\exists$ *uniqueness* − sit_0 ⟨ LIKE, subj-role:z,obj-role: s ⟩ z:x ⟩
CONDITIONS-ON-VALUE: s: *uniqueness* − sit_0 ⊨ ⟨ IDENTICAL-TO-(**john** or **bill**), s ⟩,
uniqueness − sit_0: ⟨ ⊨ *uniqueness* − sit_0 ⟨ =, h(z), s ⟩ ⟩

(By the definition of α-binding, this is equivalent to:)

c. ⟨ λh ⟨ EACH, PERSON(x), ⟨ λx ⟨ λz $\exists$ s $\exists$ *uniqueness* − sit_0 ⟨ LIKE, subj-role:z,obj-role: s ⟩ z:x ⟩ h:− ⟩
CONDITIONS-ON-VALUE: s: *uniqueness* − sit_0 ⊨ ⟨ IDENTICAL-TO-(**john** or **bill**), s ⟩ *uniqueness* − sit_0: ⟨ ⊨, *uniqueness* − sit_0 ⟨ =, h(z), s ⟩ ⟩

That is a specification for a dependency that relates people to whichever of **John** or **Bill** they like.

6.5.7 Possible antecedents

Our characterisation of the conditions under which dependent uses of expressions, non-interrogative and interrogative, can follow has not made any assumptions about the syntactic conditions that need hold between antecedent and dependent expressions. All that is assumed is that the syntax does not prevent the dependent argument role to be within the scope of the role associated with the antecedent expression.

The general prediction this type of account makes, then is this: subject argument roles always have object argument roles in their scope, whereas the converse is only true for objects that can have a scope wider than the subject. From this it follows that a basic subject/object asymmetry should be exhibited: expressions associated with object argument roles should allow dependent uses, whereas the only cases where such uses should arise with subject expressions is correlated with the ability of the object expression to scope widely.

(663) VP Skel-Cont with dependent use object: ⟨ λz ∃ s ∃ $uniqueness - sit_0$ ⟨ LIKE, subj-role:z,obj-role: s ⟩, WHERE ⟨ ⊨, $uniqueness - sit_0$ ⟨ =, h(z), s ⟩ ⟩

The object parameter has been bound, regardless of the scopal properties of the subject.

(664) Sentence Skel-Cont with dependent use: ⟨ λz ⟨ BACKED-OUT, backer-out:z, backed-out-from: x ⟩ z:s ⟩

s will only be absorbed if x is scoped wider than the subject.

The discussion above shows that an asymmetry in the availability of dependent readings is to be expected:

- wh-phrases filling an object role can be used dependently on any subject filler, regardless of its scopal propoerties.
- wh-phrases filling a subject role can be used dependently only on object fillers that can be scoped over the subject.

Notice that this account applies generally to dependent uses, and does not depend on an assumption that wh-fronting is involved. This suggests one advantage of the current account over a related one, namely Chierchia's functional crossover account (Chierchia 1991). This latter account pinpoints the problem as involving crossover between a functional trace, the antecedent and the interrogative. However, by making recourse to functional traces the asymmetries involving non-fronted interrogatives such as alternative phrases are hard to account for.

6.6 Reprise uses

6.6.1 Introduction

In this section, we offer a preliminary proposal concerning reprise uses of interrogatives. The main problem to contend with, it would seem, concerns the intonation/semantics interface about which we have nothing to contribute in the current

work. Explicit attention to intonation would, plausibly, allow us to pinpoint differences in reprise/non-reprise uses on disambiguation by an intonational element rather than assume, as we shall, that this aspect of meaning is one that gets disambiguated solely on a contextual level.

6.6.2 Meaning description for reprise uses of sentences

For reasons given in section (6.3), we assume that reprise uses of interrogatives involve syntactically declarative sentences that carry interrogative meanings. This means simply that such sentences do not contain an element specified for the feature QUE.

Thus, the sentential meaning description we write is for declarative sentences, and hence covers reprise uses of both assertoric and interrogative contents. The basic characterisation we provided in section (4.4) was the following: a reprise use of a declarative S with an assertoric content p_0 in a context c_0 was characterised, schematically, as follows:

1. A sentence S_0 whose illocutionary force is IF_0 has previously been uttered.

2. The descriptive content of the reprise use of S in c_0 is $IF_0(p_0)$.

A use of a declarative S one or more of whose argument roles are associated with interrogative phrases used to reprise is characterised identically, save for the fact that the reprised argument roles are left unfilled:

1. The descriptive content of S used in c_0 is $\alpha x_1, \ldots x_n \langle\, IF_0(p(x_1, \ldots x_n)) \,\rangle$.

The idea will be to control the relativisation of the content to the reprised illocutionary force by means of a closure operation modelled on the α-CLOSURE function: in the case of assertoric contents this ensures the reprised force has widest scope. In the case of interrogatives containing both reprise and non-reprise uses, the reprised interrogatives have scope over the the reprised illocutionary force, which in turn scopes over the non-reprised interrogatives.

Consequently, three additions are required to our inventory of meaning descriptions: declaratives will have an optional specification for a reprised force. Interrogative expressions will be provided with an additional class of uses, which will control their scoping by means of REPRISE-α-CLOSURE.

(665) a. S[fin][1] $\rightarrow$ (H,(VP[fin])), (C, NP[nom])

b. [S]($dis-sit_0, reprise-force_0, reprised-speaker_0$) = REPRISE-$\alpha$-$CLOSURE$(Quant-CLOSURE($\langle$ Skel-Cont(VP), Skel-Cont(NP) $\rangle$))
CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP);$dis - sit_0 \models \langle$ REPRISING, S, $reprise - force_0$, $reprised - speaker_0 \rangle$

(666) a. S[fin][2] $\rightarrow$ (H,S[fin, INHER—SLASH([1]), TO-BIND—SLASH([1])]), (F,[1])

S ($dis-sit_0, reprise-force_0, reprised-speaker_0$) = REPRISE-$\alpha$-CLOSURE(Skel-Cont(H))
CONDITIONS-ON-VALUE: combine the Restr-Cont(H) with the Restr-Cont(F); $dis - sit_0 \models \langle$ REPRISING, [2], $reprise - force_0$, $reprised - speaker_0 \rangle$

Notice that reprise uses force the context to fix a discourse parameter, namely the illocutionary force of the previous utterance. For notational convenience, we have split this in two: reprise-force and reprised speaker.

The different condition of use we specify for reprises is the following:

(667) $dis - sit_0 \models \langle$ REPRISE,'who', AT: $absorption - point_0$

We stipulate that meaning descriptions containing such facts in which the sentence does not contain a REPRISING condition are incoherent. There are obviously more interesting ways of doing this (e.g. by introducing an appropriate non-local feature into the sign, associated with a reprise intonation of the interrogative.), but we shall not explore them here.

The definition of REPRISE-α-CLOSURE:

(668) REPRISE-α-CLOSURE$(A_0, \sigma) = \alpha Q(b_i), \ldots Q(b_m)$ ⟨ $reprise-force(A_0)$, repriser: $reprised-speaker(A_0)$
reprised-content: $\alpha P(a_1), \ldots, P(a_n)$ σ ⟩,
WHERE $b_i, \ldots, b_m, a_1, \ldots, a_n$ is the longest sequence of NP sub-utterances of A_0 such that for each j, $0 \leq j \leq m$, $Q(b_i)$ = Skel-Cont(b_i)
and ⟨ REPRISE, b_i, AT:A_0 ⟩ and for any i, EITHER ⟨ α-IND-SCOPING-POINT, a_i, AT: A_0 ⟩ and $P(a_i)$ = Skel-Cont(a_i)
OR ⟨ α-DEP-SCOPING-POINT, a_i AT:A_0 ⟩ and $\exists$ z⟨ DEPENDENCY, $P(a_i)$, a_i z ⟩

6.6.3 Examples

An assertoric content

(669) a. A: So, anyway, Jill likes Bill.

b. B: Oh yeah, (reprise:) Jill likes Bill?!

(670) a. [likes Bill] $(dis - sit_0)$ = λx ⟨ LIKE, subj-role:x,obj-role: **bill** ⟩

b. [Jill likes Bill]$(dis - sit_0, reprise - force_0,$
$reprised - speaker_0)$ = ⟨ $reprise - force_0$, $reprised - speaker_0$, reprised-content: ⟨ λx ⟨ LIKE, subj-role:x,obj-role: bill ⟩ x: jill ⟩ ⟩
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ REPRISING, 'Jill likes Bill', $reprise - force_0$, $reprised - speaker_0$ ⟩

The main point to note is that addition of the condition
$dis - sit_0$ |= ⟨ REPRISING, 'Jill likes Bill', $reprise - force_0$,
$reprised - speaker_0$ ⟩ means that the assertoric descriptive content of the sentence gets relativised to the antecedent illocutionary force.

A unary wh-sentence

(671) a. Bill likes WHO?

b. Skel-Cont: αt ⟨ *reprise* – $force_0$, *reprised* – $speaker_0$, reprised-content: ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:bill ⟩ ⟩

(By the definition of α-binding, this is equivalent to:)

c. Skel-Cont: ⟨ λ t, ⟨ *reprise* – $force_0$, *reprised* – $speaker_0$, reprised-content: ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:bill ⟩ t:– ⟩

Instantiating the reprised force to SAID, this yields

d. Skel-Cont: ⟨ λ t, ⟨ SAID, *reprised*–$speaker_0$, reprised-content: ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:bill ⟩ t:– ⟩

Notice that this provides for a meaning description identical apart from conditions of use to the meaning description of independent uses of 'who' in

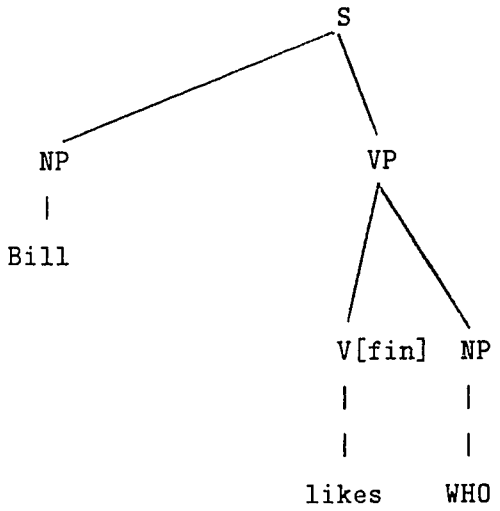
(672) You said that Bill likes who

or

(673) Who did you say that Bill likes

.

In detail:



(674) a. [WHO]($dis-sit_0, domain-sit_1$) = t,
CONDITIONS-ON-VALUE: $dis-sit_0$ |= ⟨ REPRISE, 'whom', AT: 'Bill likes WHO' ⟩; t: $domain-sit_1$ |= ⟨ PERSON, t ⟩

b. [likes WHO] ($dis-sit_0$) = λx ⟨ LIKE, subj-role:x,obj-role: t ⟩

c. [Bill likes WHO]($dis-sit_0, reprise-force_0$,
$reprised-speaker_0$) = αt ⟨ $reprise-force_0$, $reprised-speaker_0$, reprised-content: ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:bill ⟩ ⟩
CONDITIONS-ON-VALUE: $dis-sit_0$ |= ⟨ REPRISE, 'whom', AT: 'Bill likes WHO' ⟩; t: $domain-sit_1$ |= ⟨ PERSON, t ⟩;
$dis-sit_0$ |= ⟨ REPRISING, 'Bill likes WHO', $reprise-force_0$, $reprised-speaker_0$ ⟩

A mixed independent/reprise

Consider now, the following reprise use:

(675) Who likes WHO

Here we have what has been called a 'second order' question: we see that nothing additional has to be said for such a case beyond what we saw previously.

(676)

['Who likes WHO']($dis-sit_0, reprise-force_0$,
$reprised-speaker_0$) = αt ⟨ $reprise-force_0$, $reprised-speaker_0$, reprised-content:αs ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:s ⟩ ⟩
CONDITIONS-ON-VALUE: $dis-sit_0$ |= ⟨ REPRISE, 'WHO', AT: 'Who likes WHO' ⟩; t: $domain-sit_1$ |= ⟨ PERSON, t ⟩; $dis-sit_0$ |= ⟨ REPRISING, 'Who likes WHO', $reprise-force_0$, $reprised-speaker_0$ ⟩
$domain-sit_2$ |= ⟨ PERSON, s ⟩; $dis-sit_0$ |= ⟨ ⟨ α-IND-SCOPING-POINT, 'who', 'Who likes WHO' ⟩

Assuming the reprised utterance was a query, and equating its illocutionary force with the relation 'ASK' yields the following:

(677) αt ⟨ ASK, *reprised−speaker*$_0$ reprised-content:αs ⟨ λx ⟨ LIKE, subj-role:x,obj-role: t ⟩ x:s ⟩ ⟩

The meaning description is identical, apart from conditions of use, to the meaning of the wh-island violating sentence:

(678) Who did you ask whether who liked

A mixed independent, dependent and reprise wh-sentence

Finally, to the most complex example in this chapter: a reprise of a query whose content involved a dependent and an independent use:

(679) a. Which person passed that thing on to which spy?

b. (Ref-question:) Which person passed WHAT thing on to which spy?

c. You know, the chain letter.

d. Oh, Bill passed it on to his elder sister, Millie passed it on to her girl friend,...

The initial query involved, say, a dependent use of 'whom' and an independent use of 'which person'. Schematically:

(680) a. Which person gave that thing to which spy.

b. αh,x ⟨ ⟨ λz $\exists$ s $\exists$ *uniqueness − sit*$_0$ ⟨ GAVE, subj-role:z, object-given: **that thing**, obj-role: h(z) ⟩ z:x ⟩

(681) [' Which person passed WHAT thing on to which spy'] (*dis − sit*$_0$, *reprise − force*$_0$, *reprised − speaker*$_0$) = αt ⟨ *reprise − force*$_0$, *reprised − speaker*$_0$, reprised-content:αh,x ⟨ ⟨ λz $\exists$ s $\exists$ *uniqueness − sit*$_0$ ⟨PASSED-ON, subj-role:z, object-given:t, obj-role: h(z) ⟩ z:x ⟩ ⟩

This complex content illustrates the independence of the three uses we have argued to characterise interrogative phrase use:

(682) a. ['Which spy'](*dis* − sit_0, *uniqueness* − sit_0,
'Which person passed WHAT thing on to which spy' , [subj-role, 'passed-on']) = s;
CONDITIONS-ON-VALUE: *dis*−sit_0 |= ⟨ α-DEP-SCOPING-POINT, 'which spy' AT: 'Which person passed WHAT thing on to which spy' ⟩ s: *uniqueness*−sit_0 |= ⟨ SPY, s ⟩; *uniqueness* − sit_0: ⟨ UNIQUE, SPY, *uniqueness* − sit_0 ⟩, ⟨ |= *uniqueness* − sit_0 ⟨ =, s, h(z) ⟩ ⟩

b. ['WHAT'] (*dis* − sit_0, *domain* − sit_1) = t,
CONDITIONS-ON-VALUE: *dis* − sit_0 |= ⟨ REPRISE, 'WHAT' AT: 'Which person...' ⟩; t: *domain* − sit_1 |= ⟨ PERSON, t ⟩

c. ['passed WHAT on to which spy'] (*dis* − sit_0) = λz ∃ s ∃ *uniqueness* − sit_0 ⟨PASSED-ON, subj-role:z, object-given: t, obj-role: s ⟩

d. ['which person'](*dis* − sit_0, *uniqueness* − sit_2, 'which person...') = v;
CONDITIONS-ON-VALUE: *dis*−sit_0 |= ⟨ α-IND-SCOPING-POINT,'which person', AT: 'which person...' ⟩; v: *uniqueness* − sit_2 |= ⟨ PERSON,v ⟩; *uniqueness* − sit_0: ⟨ UNIQUE, PERSON, *uniqueness* − sit_0 ⟩

e. ['Which person passed WHAT on to which spy'] (*dis*−sit_0, *reprise*−$force_0$, *reprised*−$speaker_0$) = αt ⟨ *reprise*−$force_0$, *reprised*−$speaker_0$, reprised-content:αh,v ⟨ ⟨ λz ∃ s ∃ *uniqueness*−sit_0 ⟨PASSED-ON, subj-role:z, object-given: t obj-role: h(z) ⟩ z:v ⟩ ⟩
CONDITIONS-ON-VALUE: *dis* − sit_0 |= ⟨ REPRISING, 'Which person passed WHAT on to which spy', *reprise* − $force_0$, *reprised* − $speaker_0$ ⟩

Chapter 7

Interrogatives and propositional entities

7.1 Introduction

In chapter 1, we provided varied evidence that interrogative sentences manifest a systematic ambiguity between two kinds of meaning. One, 'question interrogatives' (QI), provides for the descriptive content of queries and the content embedded by such predicates as *ask, wonder* and *investigate*. The other meaning, 'resolving answer interrogatives' (RI), provides for the content embedded by predicates such as *tell, know* and *guess*, which, among other uses, can serve to report a strictly partial subset of felicitous responses to queries, namely those that convey resolving answers.

Chapter 1 provided an account of the contents made available by the QI meaning, and provided a sketch of how RI meanings related to this. Chapter 2 provided detailed descriptions of the QI meanings of interrogative sentences. In the current chapter we return to investigate the nature of RI content, which, given the direct mapping between QI and RI meaning, will ultimately provide for descriptions of the RI meanings of interrogatives.

In chapter 1, we emphasised the need to distinguish *the resolving answer* from information that concerns or is pertinent to the query. The contents of *all* felicitous responses to a given query were characterised by means of an *answerhood* relation in

which they stood to the content of the query. Resolving answers, on the other hand, are, roughly, maximal and true elements in the lattice generated by the answers.

We pointed out various problems for two influential accounts of interrogatives, Karttunen's and Groenendijk and Stokhof's, that assume, essentially, that the meaning of an interrogative specifies the resolving answer to a query. In particular, Karttunen's account, that does not make QI/RI distinctions, requires positing problematic ambiguities among propositional complement predicates. Groenendijk and Stokhof's attempt to remedy this problem by casting RI meanings as extensionalised QI meanings makes predictions about the differential individuation of the two types of meanings that are false.

One of the most intrinsic problems these accounts face revolves around the veridicality manifested by the RI meaning. These accounts attempt to capture this by assuming the meaning provides on any use a true proposition (Groenendijk and Stokhof) or a property of true propositions (Karttunen). The problem this strategy raises is that it cannot account for the highly systematic contrasts in applicability to RI (i.e. to the contents made available by RI meanings) exhibited by propositional complement predicates. A predicate like *believe* is inapplicable to RI, even though it is certainly applicable to true propositions:

(683) a. Who came yesterday?

b. Bill: I believe/hope Mike did.

c. In fact, it was Mike who came yesterday.

d. # Bill believes/ hopes who came yesterday.

(684) a. Bill knows/ told me who came yesterday.

b. Bill knows/told me whether Max will leave.

That applicability to RI cannot simply be characterised in terms of *factivity* is demonstrated by the fact that embedding predicates that are not intrinsically factive, such as *tell* or *guess*, *are* applicable.

It turns out that the class of propositional embedding predicates that are applicable to RI, far from being idiosyncratically determined, *pace* Grimshaw 1979, *is* highly predictable, and apparently stable across a wide range of languages. For these reasons, we take as our basic desideratum the provision of an account of RI meaning that can explain which propositional complement predicates are and which are not applicable to RI.

The basic strategy we will pursue is the following: building on insights of Vendler 1972, it will be proposed that (at least) two different propositional notions need to be distinguished. The first corresponds to an *outcome* or *state-of-affairs*, a subclass of which are the *facts*. The second notion can be likened to a *claim* or a *predication of factuality of an outcome*. We will propose one modelling for this conceptual distinction, using logical tools from situation theory.

Using this distinction, we then probe the class of propositional complement predicates, and argue for a partition between predicates that can, and in some cases must embed outcome-like entities, and those that must embed only claim-like entities. Since independent reasons point to the conclusion that the content made available by the RI meaning is outcome-like, more specifically *fact-like*, this will lead to an explanation for the inapplicability of claim-embedding predicates to RI. We will, thus, be driven to reconsider the notion of a proposition, and, *inter alia*, to distinguish between *true claims* and *facts*.

Our basic strategy throughout is to start from an assumption of *univocality* of the embedding *predicates*, when this is plausible, regardless of the particular syntactic form of their complement (interrogative sentence, declarative sentence, NP etc.), while positing quite fine, though hopefully well motivated, distinctions in the semantic universe. To the extent that the approach is successful, it points to a far stronger *semantic* basis for complementation than is at present assumed in many generative frameworks. It indicates an intrinsic redundancy in the notion of *semantic selection* due to Grimshaw 1979, according to which *each* complement embedding predicate needs to be explicitly specified for the various (semantic) types of complements it can embed.

The approach to the semantics of indirect discourse which we adopt uses *singular*

propositional entities, for instance the SOA's that have figured in chapters 1 and 2, in combination with something like meaning, character or attitude state v. content distinctions. The basic idea, then, is that the semantics of a VP containing a propositional complement does get its content by composing the relation denoted by the embedding verb with the standard content of the complement, a singular proposition. In addition, however, the embedding predicate contains another (semantic) argument, which we might paraphrase as 'the agent's (i.e. the entity whose cognitive act is being reported) perspective on the proposition'.

What this leads to, in a way, is a restoration of 'innocence' to the semantics of embedded discourse, in the sense that the semantic contribution of the embedded sentence is the usual denotation of the sentence, at the price of complicating the embedding predicate by the postulation of the perspective argument. In our semantic rules in later sections, we ignore this complication, though we always have the means to make it explicit, if the need arises.

7.2 On the nature of RI content

7.2.1 Facticity of construction

An advantage afforded by distinguishing between two types of interrogatives is that it enables one to make sense of a well known fact involving predicates applicable to RI that does not seem to pertain to QI predicates. Ever since Baker 1968, it has been known that embedding involving RI complements is veridical. In other words, regardless of whether a predicate is inherently veridical, as indicated by its behaviour as an embedder of 'that-clauses', embedded interrogative complements are veridical.

(685) a. Jill told me/(managed to) guess(ed) who arrived from Europe yesterday.

b. Hence, Jill told me/guessed that Bill and John arrived from Europe yesterday.

Only if,

c. In fact, Bill and John arrived from Europe yesterday.

The embedded interrogative is intrinsically veridical: falsity or truth cannot be *predicated* of it:

(686) a. Bill told us (# incorrectly/falsely) who was coming.

b. Bill told us incorrectly/falsely that Jill was coming.

(687) a. # It is true who came to the party.

b. It is true that Bill came to the party.

Truth is applicable appositively:

(688) Jill told me, accurately enough I suppose, who came to the slugfest.

Further evidence that the veridicality is not intrinsic to the predicate is indicated by reports of felicitous responses to queries. We would not assent to (689b) as a report of the dialogue if we were aware that Mike were *not* Jill's best friend. Rather, we would be forced to use something like (689c):

(689) a. Q: Who is your best friend?

Jill: (points at Mike)

b. (With that gesture) Jill indicated unequivocally who her best friend was.

c. Jill provided an indication, albeit a false one, of who her best friend was.

Similar comments apply to (690):

(690) a. Q: Who do you think offered me a job today?

Jill: Dunno, Dan Quayle perhaps.

b. Jill guessed who offered me a job.

c. Jill made a guess about who offered me a job.

Furthermore, the infelicity of the report in (691c) seems to follow from the necessary veridicality of the RI complement, not from the act of guessing:

(691) a. Q: Guess who came to dinner.

b. Jill: Oh, I can't.

c. # (As a report of this dialogue:) Jill didn't think she could make a guess about who came to dinner.

d. Jill didn't think she could guess who came to dinner.

Finally, although it is clear what the claim made in (692a) is, it is far less clear what (692b,c) concern:

(692) a. Jing made a wrong prediction concerning who would come to the party.

b. ? Jing incorrectly/falsely predicted who would come to the party.

c. ? Jing predicted incorrectly/falsely who would come to the party.

Whatever a prediction is, it is clear that it needn't come out right in all cases. (692a) describes one such scenario. (692b,c), on the other hand, seem to concern not the accuracy of the prediction, but some kind of inappropriateness involved in a particular act of prediction (Jing, for instance, had no business trying to predict whatever he did, he was acting under false pretences etc.).

7.2.2 Exhaustiveness v. Completeness

There are two notions of 'maximality' that have applicability in characterising the contents made available by RI meanings. The first is *exhaustiveness*. This is the property of being maximal in the lattice of answers to the question relative to the usual information containment partial ordering. The second notion is *completeness*. This is a property that is far harder, if at all possible, to define in semantic terms; roughly, this is the property of being information that provides a complete resolution of the issue described by the question.

It is clear that in various cases the two notions coincide. Modal contexts, as examples provided by Hintikka seem to suggest, serve to pinpoint the differences. The notion of *completeness* appears to be the one pertinent to RI meaning.[1]

The contradictory nature of examples such as the following were first pointed out in Baker 1968 and suggested that exhaustiveness was carried by RI complements:

(693) a. Jill found out who came to the party, though she didn't find out that Mary came to the party.

b. Jill knows where the NYT is sold in Palo Alto, though she doesn't know that you can (also) buy it at Miyake's Palo Alto store.

Hintikka, however, has pointed to cases such as the following:

(694) a. Bill knows how to get from Oxford to London, (though he isn't aware of all possible routes.)

b. Jill knows who to go to in case of trouble (namely, a shrink), (though she isn't aware that she can turn to Billy Graham).

These sentences appears to be true even if Bill knows just one route that leads from Oxford to London, or just one of many people to turn to or even a description of such a person, whereas the negation appears to be true if Bill doesn't know a single such route or person:

(695) a. Bill doesn't know how to get from Oxford to London.

b. Bill doesn't know who to go to in case of trouble

[1]Although much of recent semantic literature has assumed exhaustiveness (e.g. Karttunen 1977, Groenendijk and Stokhof 1984, Engdahl 1986.) Hinttika has been a consistent skeptic. However, we do not accept his claim for the need for an ambiguity between a meaning that is *inexhaustive* and one that is *exhaustive*. Rather, what the data suggests is that on those occasions which Hintikka would characterize with *inexhaustiveness*, completeness applies. Berman 1990 follows Hintikka and argues against intrinsic exhaustiveness. His basic account assumes an *inexhaustive* meaning that can become exhaustive in the absence of any other indicated force. Berman does suggest, drawing on Grewendorf 1983, that the proper notion of exhaustiveness is ultimately pragmatic.

Adverbial modification suggests, however, a more uniform picture:

(696) a. Jill knows to some extent who Mary went to for moral support when she was fired.

b. Jill knows to some extent who to go to for moral support if she's fired.

In both cases, the adverbial modification suggests that Jill has partial information concerning the resolution of the question, without imputing partial exhaustiveness. Admittedly, (696a) implicates quite strongly that Jill knows the identity of some of the people who provided Mary with moral support after she was fired. In (696b) this implicature is markedly weaker.

Notice, however, that whether information constitutes a complete resolution of a question seems an issue plagued by vagueness:

(697) a. Q: How do I get from London to Oxford?

A: Take the 11:24 from Paddington.

b. (Querier is a foreigner) I asked a stranger how I should get from London to Oxford, and he provided me only with a vague indication of how to.

c. (Querier is knowledgable about London trains) I asked a stranger how I should get from London to Oxford, and without batting an eyelid he told me.

Similarly, exhaustiveness in and of itself can also be insufficient for completeness:

(698) a. Q: Who works in this institute?

Bill: (Provides list of names)

b. (Querier is local) I asked Bill who works in this institute, and he told me.

c. (Querier is foreign) I was passing by an institute and asked someone who was sitting nearby who worked there. He wasn't really willing to tell me, beyond reciting a list of names, none of which meant much to me.

7.2.3 Adverbial Modification: QVE effects

The ability of adverbials to modify the completeness of an RI complement provides evidence that it is completeness and not exhaustiveness that is the relevant factor in RI meaning, as we saw in the examples (696). Thus, although on the one hand adverbials might appear to modify the force of exhaustiveness, as in the following example first pointed out by Berman 1990:

(699) Sue remembers for the most part who Mary went out with last year. (The argument role associated with the wh-phrase can be understood to have the quantificational force of the adverb. Thus, it can be understood as asserting, roughly, that Sue remembers most instantiations of the open sentence 'x is a person Mary went out with last year'.)

Exhaustive answers that are incomplete can be reported using an RI complement suitably modified. In other words, the adverbial serves to modify the completeness:

(700) a. Q: Who works in this institute?

Bill: (Provides list of names)

b. (Querier is foreign) I was passing by an institute and asked someone who was sitting nearby who worked there. He recited a list of names, so to some extent I now know who works there.

c. By reciting the list of its employees, Bill indicated, to some extent, who worked in the institute.

This pattern of adverbial modification is applicable to any elements having part structures, which one could characterise technically as being non-atomic elements in lattices.

(701) a. John mostly/hardly knows who came to the party.

b. John mostly/hardly likes what I like.

c. John mostly/hardly detests my friends.

Notice that in contexts where the fact that questions have part structure is plausible, adverbial effects do arise:

(702) a. The question, how to build the space shuttle, was intricately structured. Bill finally managed to formulate it, and by the time the session ended, to convey it, to a large extent, to the participants. That is, he asked how the wings would be designed, what type of fuel it used, etc.

b. The question was which students to invite over on Monday. We've only discussed it to a limited extent. For instance, whether to invite Zhang or Millie.

This latter point, that the effect can apply to virtually any elements having part structures has been made, independently and in detail, by Lahiri 1991, who brings up an example like

(703) Mary knows Beethoven's 5th symphony, in part.

Berman, the first to point out these adverbial effects, proposed a quite different account: he assumed that the adverbial modification effects concerning the embedded interrogatives arise only with factive *predicates* (since he assumed that RI/QI distinctions pattern along such a line). Consequently, in his account, the effect arises using standard DRT apparatus: the embedded clause gets presupposed and added to the restrictive clause, and the adverb binds the wh-phrase which contributes a variable to content. Hence, these effects were dubbed 'quantificational variability effects' (QVE).

As we have seen above, however, the ability of an adverb to modify the force of an RI complement is entirely independent of the factivity of the predicate, and can occur even with QI complements.

Moreover, there are actually few adverbs that do trigger a modification in the force of the embedded complement.[2]

(704) a. Bill mostly/for the most part/hardly knows who came (comes) to the bar why Jill came (comes) to the bar. (What matters here is that Bill be aware of

[2]Srivastav 1991 makes a similar point.

the majority (or of a small minority in the case of 'hardly') of comers or reasons.) (Instances of QVE)

b. Bill rarely/seldom knows who came (comes) to the bar/why Jill came (comes) to the bar. (Not true if argument role associated with the interrogative gets quantificational force of adverb, and yet most situations allow for exhaustive knowledge of the comers or the reasons.)

c. In a number of cases/On a number of occasions, Bill has found out who was at the bar the previous evening/why Jill came (comes) to the bar. (Mutatis mutandis as for (704b)).

It seems, then, that most adverbs of quantification behave as in (704b) and (704c): even 'usually', that appears to be very close in meaning to 'mostly', cannot really modify the force of the answer. It is only adverbs that trigger distributivity effects in general that can modify the force of the embedded interogative complement.

7.2.4 Applicability to RI contents

In section (1.3.4) we provided data characterising the patterns of applicability to RI in English. We reinforcee the semantic basis of this phenomenon by providing data that indicates similar patterns in Hebrew.

Two main classes of propositional complement predicates that cannot embed interrogatives emerge.

Non-veridical attitude predicates

Regardless of the truth of the (potentially) embedded content, non-veridical propositional complement predicates such as *believe* or *hope* are inapplicable to RI:

(705) a. Q: Who came yesterday?

Bill: I believe/hope Mike did.

In fact, it was Mike who came yesterday.

b. # Bill believes/ hopes who came yesterday.

These facts carry over to Hebrew:

(706) a. # Eran ma'amin/mekave mi higia'a etmol.

b. Eran believes/ hopes who came yesterday.

c. # Eran ma'amin/mekave im Avi ya'azov.

d. Eran believes/ hopes whether Avi will leave.

(707) a. # Dani meni'ax mi higia'a etmol.

b. Dani assumes who came yesterday.

c. # Ofer meni'ax im Moshe ya'azov.

d. Ofer assumes whether Moshe will leave.

Suitably veridicalised counterparts of these predicates all embed FI complements:

(708) a. Dani yodea mi higia'a etmol.

b. Dani knows who came yesterday.

c. Dani yodea im Moshe ya'azov.

d. Dani knows whether Moshe will leave.

(709) a. Eran zoxer/alul lishko'ax eyze xaluc yesaxek be'eyze emda bamisxak maxar.

b. Eran remembers/might forget which forward will play which position in tomorrow's game.

c. Eran zoxer/alul lishko'ax im Hapo'el zaxta bagavi'a.

d. Eran remembers/might forget whether Hapo'el won the cup.

Opinion-influencing illocutionary report predicates

The attribute 'Opinion-influencing' (OI) of an illocutionary report predicate is intended to single out those predicates in which the reporter of the illocutionary act represents the agent of that act not merely as a link in an information channel, but rather as a source of a claim. While links in information channels can sometimes be faulty, and hence provide misinformation, the default assumption is that they are reliable. On the other hand, with OI predicates there is no implication that the claim represented as emanating from the agent is true.

A number of semantic and pragmatic tests follow from this rough characterisation:

- If P is an OI predicate, someone r reporting an illocutionary act made by o using P implicates that he, r, does not know that the o's claim is true. Conversely, reportive predicates that are non OI, reflect Gricean conventions of communication, and implicate that the claim is true. The implicatures are cancellable, but their existence is indicated by the naturalness of using 'it turns out', a typical hedge, as a means of cancellation.

  (710) a. Bill alleged/claimed that Mary was drunk last night. (Bill turns out to have been right.)

  b. Bill told me/reported that Mary was drunk last night. (It turns out Bill was wrong.)

- OI reports where the content of the claim turns out to be false do not, of necessity, implicate the agent to have acted dishonestly. Non-OI reports in corresponding cases do:

  (711) a. Missie said to/told me she had a solution to the problem. She didn't. # Missie was being honest, if sloppy.

  b. Missie claimed/asserted that she had a solution to the problem. She didn't. Missie was being honest, if sloppy.

'Opinion influencing' predicates such as 'argue', 'claim', 'assert', 'allege' and 'deny', do not embed RI complements, again regardless of their truth:

(712) a. Q: Who came yesterday?

Bill: I'd like to persuade you that Mike did.

In fact, it was Mike who came yesterday.

b. # Bill claimed/argued who came yesterday.

(713) a. Q: What do you think, will Max leave?

Bill: I'd like to try and convince you that he will.

In fact, Max will leave.

b. # Bill claimed/argued whether Max will leave.

These facts carry over to Hebrew:

(714) a. # Avi ta'an/he'elil eyze yalda xamda eyze safsal.

b. Avi claimed/insinuated which girl coveted which stool.

c. # Avi ta'an/he'elil im titkayemna sixot hashalom

d. Avi claimed/insinuated whether there would be peace talks.

Non-OI predicates, including non-veridical reportive predicates do embed FI complements:

(715) a. Nir siper lanu/ciyen beoznenu eyze yalda xamda eyze safsal.

b. Nir told us/indicated to us which girl liked which stool.

c. Nir hicliax lenaxesh/laxzot im titkayemna sixot shalom.

Nir managed to guess/predict whether there would be peace talks.

Emotive Idiosyncracies

The class of emotives consists of factive predicates which describe an agent's positive or negative attitude towards some outcome. These include 'regret', 'resent' and 'be pleased at'. These predicates are somewhat marginal with wh-sentences, but quite infelicitous with yes/no interrogatives.

(716) a. Ruti regrets to this day which car she selected many years back.

b. ? Bill resents which people decided to crash his party.

c. # Jill regrets/resents whether Mike left town yesterday.

One can speculate that yes/no interrogatives are infelicitous in these cases because such predicates express a positive or negative attitude to an outcome, whereas the yes/no FI complement does not specify which outcome actually is the case. If the reporter does not know the outcome, it is strange that he can report the agent's attitude towards it. If he does, he should specify what it was.

7.3 Explanatory strategies

7.3.1 Characterising RI applicability: pragmatic account

One possible pragmatic account of the applicability problem suggests itself. There is an essentially illocutionary criterion that works fairly well in distinguishing the non-veridical predicates inapplicable to RI from those non-veridical predicates that are applicable.[3] This is the following 'sincerity criterion':

(717) V is *sincerely ignorant* iff 'I didn't know that p, but (in fact) I V'ed that p' does not entail p and does not entail that the speaker was being insincere.

- All non-veridical propositional-attitude predicates (e.g. 'believe', 'hope') are sincerely ignorant, since they are bounded above by *know*.

[3]See Boër 1978 for a proposal in a similar spirit.

- Many non-factive RI predicates are not sincerely ignorant, as we implicitly suggested in the previous section:

  (718) I didn't know that that my solution of the problem was correct, but I told Jill/announced to the others that it was. # I was being sincere, if sloppy.

  However, some non-factive RI predicates *are* sincerely ignorant:

  (719) I didn't know that my solution to the problem was correct, but I guessed/predicted that it was. I was being sincere, if a bit intemperate.

The idea would be to use this criterion to derive 'Moore's paradox' type cases for first person (attempted) RI embeddings. Let q be a interrogative of whose (true and complete) answer on a given use a speaker is not aware, and V be a *sincerely ignorant* verb such as 'believe'. Assume that RI meanings are answers to the question presupposed to be true. Then, the following could be derived:

(720) a. I V q.

b. # I V that p, which is a true answer to q, but I don't know that p.

For instance,

(721) a. # I believe who came to the party.

b. I believe that p, which is a true answer to the question of who came to the party, but I don't know that p.

Hence, the account would go, (721a) is infelicitous because it is contradictory.

This kind of account could conceivably be extended to non-first person cases by considering, for instance, what an agent whose beliefs were being reported would assent to. It is not straightforward to see how this account could explain cases where the resolving answer to the question *is* known to the speaker, since infelicity is maintained in such cases:

(722) I know who came to the party, # so, clearly, I also believe who came to the party.

It is even more difficult to see how to extend this approach to non-matrix cases of embedding or negation, in which RI complements are still infelicitous, but for which there does not seem a way of causing the contradiction to arise:

(723) a. # I don't believe which person likes what.

b. I don't believe any proposition p that is a true answer to the question which person likes what, but/and I don't know any proposition p that is a true answer to the question which person likes what.

The problem is that using semantic properties of predicates to explain the properties of their arguments, some care needs to be entertained. Properties that pertain to the illocutionary acts performable or describable by these predicates are not (necessarily) preserved under negation or embedding. Properties that are entailments are not preserved under negation (and certain types of embedding.).[4]

Thus, in seeking an explanation for why a certain class of propositional argument predicates does not embed facts, we seem forced to look to the appropriateness (or in some terminologies selectional) restrictions such predicates impose on their arguments, since it is these that are preserved under negation and embedding, not entailments. That is, we need to try and understand what kind of objects can undergo predication by OI and non-veridical propositional attitude predicates.

7.3.2 On the fact/true claim distinction

Given the failure of an explanatory strategy of the type explored in the previous section, we will pursue a different line, which is to assume that what RI complements denote is an *inappropriate* argument for those propositional embedders that fail to embed it. In other words, a clash exists between the appropriateness restrictions

[4]The malaise that (putative) explanations along this line suffer from has been dubbed 'the Illocutionary fallacy' in Searle 1969.

which the predicate specifies for its complement and the very nature of the content made available by the RI meaning.

An appeal to 'appropriateness restrictions' to explain infelicity is not fundamentally more interesting than an appeal to subcategorisation *unless*

- Evidence is supplied exhibiting other objects of similar denotation type, but distinct syntax, which similarly fail to be embedded by these predicates.
- The existence of the postulated entities has some ontological plausability, and can be modelled logically without undue complication.

We provide a rough illustration of the idea and the basic problem we face in developing it.

Assume an RI complement denotes on any use an indefinite description for a propositional entity, which is presupposed to be a *factual* answer, in a sense to be determined, to the question denoted on that use by the QI.

(724) a. 'Jill told us who came' is paraphrased as 'Jill told us p, for some proposition p, that is a factual answer to the question 'Who came'.'

b. 'Jill didn't tell us who came' is paraphrased as 'Jill didn't tell us any p that is a factual answer to the question 'Who came'.'

Why do predicates like *allege* or *claim*, for instance, on this semantics, fail to embed RI complements?

(725) a. # Bill alleged whether Mike had stolen the goods.

b. # Dana claimed who was coming to the party.

The idea is that such predicates cannot apply to propositional objects that are *facts*, which RI complements happen to be. In other words, predicates such as *allege* or *claim* impose a restriction on their complement that they not be (represented as) *facts*. Notice that this does not mean that the propositional entities denoted by

complements of such predicates cannot *turn out* to be true, and hence corresponding to a fact, only that *qua* claim or allegation they cannot be represented as such.

However, in order for this sort of account to work, *facthood must be distinct from truth*. For one thing, the following is felicitous:

(726) a. Bill alleged something that turned out to be true.

b. Jill made a claim, a true claim, in fact.

Furthermore, even if one could justify some sort of appropriateness restriction against true (or presupposed to be true) propositions as arguments of Opinion Influencing predicates, this would lead to serious problems with non-veridical propositional attitude predicates. Once again cancellation data of the following kind appear to indicate that there is no *conventional* implicature that bounds 'believe' by 'not knowing':

(727) a. Jill believes that John was on MDA last night, in fact she knows it.

More crucially, even if one does not desire to *reduce* knowledge to strengthened belief, it seems plausible that 'know' is bounded below by 'believe':

(728) # Bill knows that, but he doesn't believe it. ('Believe' can only be understood here in the sense 'accept' or 'be reconciled with'.)

Thus, building into 'believe' some appropriateness condition that its complement is *not known* will result in contradiction.

So, a propositional entity being a fact might be taken to mean something like 'a representation of the world, relative to a necessarily accurate perspective.' Now, plausibly, the complement of 'claim' or 'believe' is required to denote an entity that is not intrinsically factual. This requirement is dissonant with the RI complement being a fact, in the sense just articulated.

In choosing this path, we build upon insights of Zeno Vendler, who originally suggested an account along such lines (Vendler 1972) to explain various differences

between the verbs *know* and *believe*, in particular the contrasts they exhibit with respect to licensing of RI complements.[5]

7.4 Outcomes v. Claims

7.4.1 Basic intuition

We propose the existence of two types of basic propositional objects: claim-like and outcome-like. A useful analogy to bear in mind is that of a picture and a scene an aspect of which the picture (potentially) depicts.

The basic propositional objects, the outcome-like ones, are to be seen as pictures, some of which, the facts, depict scenes that are realised. Natural language carries a wide array of nominals that denote entities of this basic type: *possibility, fact, outcome, cause* etc. As such these entities are not truth bearers. One can pick a certain class of scenes and decide which of the pictures do depict scenes in the given class, which do not. Hence, indirectly, it is possible to predicate of each picture whether it is actual, relative to a given class of scenes. Of the picture-like entity itself, however, it does not make sense to say whether it is accurate, exaggerated etc. It makes no sense to *justify* the picture, only its accuracy as a picture of a certain scene.

The more complex propositional objects are the claim-like ones, which should be seen as the *association* of a scene with a depiction. Nominals in Natural Language which denote such entities include *claim, story, version* etc. For these entities it makes perfect sense to discuss their accuracy, or truth in the sense that the association between picture and scene is warranted or not, is faithful or exaggerated etc.

7.4.2 Truth v. Facthood

Vendler 1967 tries to motivate a distinction between facts and true propositions ('claims', for us) by showing that they stand in different relations: facts (holding)

[5]The relevance of the distinctions pointed out by Vendler to issues of different modes of informational representation is emphasised in Barwise 1989.

cause events and result from certain other events, whereas neither of these relations apply to propositions or claims (being true):

(729) a. The fact that Man U won the league resulted from various changes having taken place in its management team.

b. The fact that Man U won the league caused many supporters to go berserk.

(730) a. # The (truth of the) proposition/claim that Man U won the league resulted from various changes having taken place in its management team.

b. # The (truth of the) proposition/claim that Man U won the league caused many supporters to go berserk. [Seems to imply that the team's supporters were overly ponderous for their own good.]

This kind of argument, although of some appeal, does tread on somewhat slippery ground. As Bennett has observed in a slightly different context, it is a dicey game to assume that a common-noun-phrase headed by a particular nominal ('fact', 'proposition', 'event' etc.) produces a description (sharing properties) of the entity of the desired ontological pedigree.[6]

7.4.3 Situation Theoretic Modelling

Using situation theory we can capture these basic intuitions as follows: the outcome-like entities correspond to SOA's (see chapter 3 for motivation and basic definitions.).

Some SOA's are *factual* in the sense that the states-of-affairs they picture actually obtain, that is there exists some situation that is, as it were, a witness to their obtaining. Consider the SOA

(731) $\sigma =_{def}$ ⟨ MESSY, pred-obj: **J's-table** ⟩

[6]Bennett 1988, p.6. Vendler is not the object of Bennett's scorn, since Vendler provides various other pieces of linguistic evidence to support the identification of 'fact descriptions' with causal and resulting entities, some of which we shall enter into below when we show that non fact embedding predicates are also unable to embed (the denotata of) these other linguistic expressions.

where **J's table** is some actual table. Assume that, as it turns out, **J's table** is messy, then there is some part of the world that provides the evidence for this. Call this part of the world s_0. Then, the relation that holds between s_0 and σ is denoted by $\models$, and so this description of the world, specifically of s_0, is written

(732) $s_0 \models \sigma$

So, σ is factual. The converse of σ, which we depict by

(733) ⟨ MESSY, pred-obj:J's table;0 ⟩

is, in this case, given the basic coherence of things, not factual. It is, one might say, a possible way the world might be, which does not turn out to be the case.

Recall that SOA's are 'passive objects', little packets of potential information which although they can turn out to be factual or not, do not go about 'claiming' anything: they are not true or false, analogously to the fact that truth is not predicable of something which we describe as a *(possible) outcome.*

Claim-like objects are assumed to be determined by a SOA and a situation: Claim(s_0, σ_0) to be read as 'the claim that σ is the case (according to s).' This already is an 'active', truth-bearing object. We identify it with the claim that is true if and only if σ_0 is factual according to s_0.[7]

One of the differences between this way of setting things up and more traditional, non-partial modellings of propositions, SOA's and so on, is that here if $Claim(s_0, \sigma_0)$ is false, it might still turn out by looking at a bigger portion of the world that σ_0 is a fact. Then again, it might not: the converse SOA to σ_0 might be a fact, either according to s, or according to some bigger situation. Given any pair of converse SOA's, we have no guarantee that a given situation will determine which is factual (though we do assume coherence of the world: no situation would make both SOA's factual.).

[7]An alternative notation used in some other works is $(s \models \sigma)$

7.5 Outcome-complement predicates v. Claim-complement predicates

Armed with the distinction we developed in the previous section among propositional objects, we probe the category of propositional complement predicates, previously seen as uniform, and consider the subcategories that emerge.

7.5.1 Claim-complement embedders

One class that seems to emerge is a class of *claim-complement* embedders. This class includes such predicates as *believe*, *claim*, and *allege*. We show that this class resists outcome-denoting expressions, factual or otherwise.

Restrictions on NP complements

Most such predicates subcategorise for NP's, in addition to clausal categories.[8] There are tight semantic restrictions on the possible N' denotations of such NP's. The most felicitous are inanimate N's that denote (sortals of) objects whose veracity or accuracy can be entertained, e.g. 'claim', 'story', 'opinion'. In such cases 'J V'ed NP' is interpreted as 'J V'ed (the veracity/accuracy etc of) NP. Inanimate N''s that do not satisfy this requirement cannot fill the complement role:

(734) a. Jill believed/doubted/assumed Bill's story.

b. Jack denied/ believed/asserted the claim.

c. # Jill believed/doubted/assumed the cause of the war/ the first reported outcome/that particular possibility.

It appears Opinion Influencing predicates are impossible for animate NP's. As far as propositional attitude predicates go, if any interpretation is possible, it is that the cognitive agent stands in the given propositional attitude towards some claim made by the individual denoted by the NP:

[8]This argument is due, terminology and minor technical details apart, to Vendler 1972.

(735) Bill believed/doubted/#assumed/#denied Jill.

POSS gerunds

There are a number of grounds that suggest that POSS-gerunds denote facts, as discussed by Vendler 1967 and recently by Bennett 1988: POSS-gerunds are veridical, though not truth–predicable, lack duration, are virtually interchangeable with 'the fact that' nominals and, individuate with as fine a grain as (singular/Russellian) propositions. This is exemplified by the following:

(736) # Bill's arriving yesterday is false/true/dubious. (Inherently veridical; truth is not predicable.)

(737) Jill's finding #(of) the treasure took three hours. (Non-event like.)

(738) The fact that Bill arrived yesterday/Bill's arriving yesterday was a relief to us all. (Interchangeable with 'the fact that' nominals.)

(739) (Due to Jaegwon Kim, reinterpreted by Jonathan Bennett) Bill journeyed to Calais once in his life, by swimming the channel. Bill's journeying to Calais did not surprise me, though his swimming the channel did. (finely grained as propositions.)

Claim-complement predicates do not embed POSS gerunds:

(740) a. # Bill believed/alleged /assumed/doubted/claimed Jill's having discovered a new ontological distinction.

b. # Bill believed/alleged/assumed/doubted/claimed Jill's finding the treasure much before anyone else did.

Most RI predicates do embed POSS gerunds:

(741) a. Bill revealed/predicted/told us of/knew #(of)/announced Jill's having discovered a new ontological distinction.

b. Bill guessed/told us of/mentioned/predicted Jill's finding the treasure much before anyone else did.

These contrasts are noted in Kiparsky and Kiparsky 1971. The Kiparskys view ability to take a POSS complement as a sign of *factivity*, whereas we would maintain that it is the POSS gerund itself that is the source of the veridicality, given the ability of non-factive predicates such as 'tell', 'guess' and 'predict' to embed such complements in a way that maintains the veridicality.

7.5.2 Factive predicates

This class consists of such predicates as *discover*, *show*, *regret* and, arguably, *know*. These predicates are applicable only to intrinsically veridical entities denoted by expressions such as POSS-gerunds, RI complements and certain NP's headed by nominals such as *fact*. In addition, two further classes of expressions have meanings that make available intrinsically veridical entities, 'that clauses', and 'concealed questions', both of which we return to below.

7.5.3 Predicates compatible with outcomes and claims

This class contains non-factive illocutionary reportive predicates such as 'tell', 'announce', 'guess' and 'predict'.

These predicates are, in general, applicable to intrinsically veridical entities denoted by expressions such as POSS-gerunds, RI complements and concealed questions. They are also applicable to outcome-denoting nominals, that need not be factual:

(742) a. Jill predicted one outcome and I predicted a different one.

b. Max reported that specific possibility to his editor. It turned out to be incorrect.

These predicates are also applicable, apparently, to claims:

(743) a. Bill incorrectly reported that the Pope was arriving at noon.

b. Bill incorrectly reported that possibility.

In (743b) 'incorrectly' cannot modify 'that possibility', presumably because it is outcome-denoting. That is, the report is not asserted to involve a non-factual content, even though 'that possibility' could turn out to be non-factual. In (743a), however, 'incorrectly' does seem to be able to modify the embedded content, in the sense that the report appears to involve a non-factual content. Thus, it seems in this case that Bill is represented as having not merely provided a representation of a certain state of affairs, but him having intended to portray this state of affairs as *factual*, very much as if a claim were represented.

7.5.4 Concealed Question uses of NP's

QI and RI predicates that subcategorise for NP's can allow for a use of these NP's traditionally called 'concealed question' (CQ), first noted by Baker 1968.

The relevant reading of such sentences is given in (744b):

(744) a. Jill found out the winner of last night's game.

b. Jill found out who the winner of last night's game was.

This reading is interesting because finding out is not a process that seems to relate finders out (directly) to individual human entities. The only plausible reading of (745c) is one which would involve Goran Prpic engaged in some illicit or secretive activity, which would coincide with the scenario described in (745b) only if winning the game in question happened to be of that nature.

(745) a. Jill found out the winner of last night's game.

b. The winner of last night's game was Goran Prpic.

c. Jill found out Goran Prpic

This phenomenon is of especial relevance to the issues discussed in the current chapter because it provides an instance of the availability of interpretations of NP's

amenable to an account like the one proposed here for the QI/RI distinction among interrogatives. We restrict ourself to showing the following:

- Certain CQ meanings appear to provide fact-like contents.
- These meanings are applicable both to factive predicates and to the class of outcome embedders. The meanings are inapplicable to claim embedders, even though there is evidence that no syntactic incompatability can be involved.

Evidence for a fact-denoting use of CQ

That CQ NP's have a use in which they denote facts is suggested by the following:

- CQ NP's yield veridical interpretations (due to Baker 1968), regardless of the factivity of the predicate:

  (746) a. Jill (# inaccurately,falsely) told me/guessed/predicted Bill's weight.

  b. Jill told me/guessed/predicted Bill's weight (# inaccurately,falsely).

  (747) a. Jill (# inaccurately,falsely) reported to me/guessed/predicted the state of Bill's appendix.

  b. Jill reported to me/guessed/predicted the state of Bill's appendix (# inaccurately,falsely).

  In fact, a generalisation due to Grimshaw 1979 indicates that all factive and outcome-embedding predicates that subcategorise for NP's allow for CQ uses of NP's.

- Coordination: CQ NP's coordinate freely with both 'that clauses' and interrogative complements complements:

  (748) a. Bill's many lucky guesses over the years include:

  b. which girl likes which astronaut and Mike's current weight.

c. Whether Oswald actually did it and that the FBI also knows the whereabouts of the tapes.

d. Whether Bubba Paris met the weight requirement and also the Refrigerator's current weight.(but not 'and # 360 lbs.')

e. That the University did not overbill and the President's reasons for keeping quiet.

CQ and claim embedding predicates

Claim-embedding predicates do not license CQ interpretations:

(749) a. # Jack believed/doubted/assumed Bill's weight./my phone number.

b. Jill believed/doubted/assumed Bill's story/ the claim. (= believed/doubted/assumed *the veracity* of Bill's story/ the claim. Does not mean 'believed/doubted/assumed what Bill's story/the claim was.')

There are grounds that suggest that the unavailability of the CQ use for these predicates cannot be syntactic. On the one hand, the claim embedding predicates do subcategoruse for NP's, as (749b) shows. On the other hand, there is a basic argument due to Grimshaw against assuming a 'deletion' (from clausal to NP) syntactic analysis (at S-structure or D-structure) as the basis for CQ interpretations. It is this: the verbs that license CQ are precisely those that subcategorise for both NP and interrogatives. By assuming a deletion, one loses the explanation for why subcategorisation for NP is a necessary condition for CQ.

7.5.5 The status of 'that clauses'

One issue that remains is the status of 'that-clauses'. Given the evidence provided above, namely that claim-embedding predicates take only claim-like entities as arguments, while factive predicates take only fact-like entities as arguments, it seems that, in embedded contexts at least, the meaning of 'that clauses' will be required to make available at least two types of entity. Nonetheless, given our assumptions on the

fact/claim distinction, this can be done without assuming 'that clauses' themselves to be ambiguous.

The basic idea would be to have a 'that clause' denote on any use a SOA. The factive predicates are applicable only to the subclass of SOA's that are factual. A claim, on the other hand, is determined by a SOA and a situation, CLAIM(s,SOA). Thus, the ambiguity in the embedded contexts can be accommodated by assuming that in addition to the usual complement embedding rule which composes the predicate with the content of the complement (750b), an additional compositional rule exists (750c). This rule, given the SOA denoted by the 'that clause' and a contextually supplied situation, embeds the claim determined by this pair as an argument of a predicate.

(750) a. VP[fin] → (H, V[fin]), (C, S[+DECL])

b. [VP]($dis - sit_0$) = λx ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: Skel-Cont(S) ⟩;
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S)

c. [VP]($dis - sit_0, claim - situation_0$) = λx ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: Claim($claim - situation_0$, Skel-Cont(S)) ⟩:
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S).

This view of the meaning of 'that clauses' has a number of advantages. First, it enables us to accommodate anaphora to 'that clauses' embedded by the one type of predicate that gets embedded by the other type of predicate, while maintaining their distinct appropriateness restrictions:

(751) a. Bill knows that Mary is annoyed, while Tony only believes it.

b. Bill tentatively suggested that Mary was annoyed, unaware that Tony had already proved it.

In the former case, 'it' is resolved to a claim determined by the SOA embedded by (the use of) 'know' in the first clause and a contextually supplied situation. In the latter case, 'it' is resolved to the SOA that is the constituent of the embedded claim.

Second, it suggests a solution to a long-standing problem faced by accounts that have assumed factive 'that clauses' are propositions presupposed to be true, namely that such clauses *can* be informative in a way that does not appear to involve accommodation:

(752) John regrets that this service is to be discontinued shortly.

On the proposed account, the embedded clause denotes a SOA, one that is required by the appropriateness restrictions associated with 'regret' to belong to the subclass of SOA's that are *factual*. This does not require it to be a previously introduced (or accommodated) informational unit.

7.5.6 Interim conclusions: appropriateness restrictions and RI complementation

In the previous two sections we have outlined a non-uniform conception of propositional entities and its ramifications for complementation. We have sketched a conception of propositional entities that distinguishes between outcome-like entities, and claim-like entities representing the association of outcomes with situations. There is evidence that a number of propositional-denoting expressions are sensitive to the proposed distinction, denoting one or the other type of entity. This sensitivity is reflected by distributional evidence concerning the predicates that can take these expressions as their arguments.

Three categories of predicates emerge quite clearly: predicates that apply only to claims, predicates that apply only to facts, that is outcomes that are factual, and predicates that are applicable both to claims and outcomes.

The resulting sub-categories among propositional complement predicates enable us to account for the differential applicability of propositional predicates to interrogative complements. On the assumption that the RI meaning makes available an outcome-like entity, the category of claim-embedders is incompatible with such entities, just as

it is with POSS-gerunds, outcome nominals and 'concealed question' interpretation of NP's. We turn to discuss the RI meaning in detail now.

7.6 RI uses

The discussion in chapter 1 and the current chapter suggests the following as properties RI meanings must satisfy:

- **Factuality**: RI meanings provide for factual, outcome-like contents.
- **Individuation**: RI meaning is individuated with grain as fine as QI meaning: interrogatives that on any interrogatory use denote distinct *questions* that have identical sets of factual answers remain distinct in uses as RI complements.
- **Completeness**: an RI meaning provides for an entity that is a *complete* answer to the question made available by the QI meaning.

Our proposal will be that an interrogative on its RI use denotes an indefinite description for an entity that is a complete and factual answer to the question denoted by a QI use of the interrogative:

(753) a. VP[fin] → (H,V[fin]), (C, S[+INT])

b. [VP]($dis{-}sit_0$) = λx $\exists r, s_0$ ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: r ⟩;
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S); r: $s_0 \models$ ⟨ **COMPLETE-FACTUAL-RESOLUTION**, resolver: r, resolved: Skel-Cont(S) ⟩

The rule states that the interpretation of an RI VP is the property of standing in the relation denoted by V to a certain SOA, restricted to satisfy the following description: it stands in the relation **COMPLETE-FACTUAL-RESOLUTION**, to the question denoted by the embedded clause. **COMPLETE-FACTUAL-RESOLUTION**

is defined below using the relation **RESOLUTION** that served as the basis for the notion of answerhood defined in chapter 1.

The basic point of the rule is this: **the** *(question) interrogative* **is used to provide a description for a propositional complement of the verb.**

Notice that defining RI meaning using the QI meaning as we have allows us to account for anaphora to interrogatives embedded by the one type of predicate that gets embedded by the other type of predicate, while maintaining their distinct appropriateness restrictions:

(754) a. Bill asked Mary who came because she knows that.

b. Bill told Mary who came because she asked him that.

In the former case, 'that' is resolved to the RI complement determined by the QI meaning embedded by 'ask' in the first clause. In the latter case, 'that' is resolved to the unresolved SOA that is the constituent of the description in the RI complement.

On the other hand, given that 'ask' is appropriate only to unresolved SOA's, even though it subcategorises for interrogative sentences, the RI meaning will never produce a well-defined meaning if used with 'ask' as embedding predicate. Similar comments *mutatis mutandis* apply to the QI meaning and embedding by 'know'.

7.6.1 Factual Resolution

In order to understand the meaning description above, we need to understand two things: the nature of the relation COMPLETE-FACTUAL-RESOLUTION, and why there will always exist r, s_0 such that $s_0 \models \langle$ **COMPLETE-FACTUAL-RESOLUTION**, resolver: r, resolved: q_0 $\rangle$ is satisfied, for any unresolved SOA q_0. Initially, we take a 'conservative' view of this relation, taking it to relate a question to its maximally factual answer. We later briefly discuss a possible weakening of the relation.

Intuition

The basic intuition we motivated in chapter 1 was that unresolved SOA's themselves are descriptively indeterminate, that is, they do not provide a determinate picture

of the world. However, the indeterminacy they represent can always be resolved factually: there always will be a fact that constitutes a complete positive or negative resolution of the indeterminacy described by the unresolved SOA. This, of course, will not be the case if we restrict ourselves to positive resolutions, i.e. instantiations in the case of wh-questions, since, of course, the world does not ensure the existence of a factual instantiation of any given unresolved SOA.[9] The necessary existence of a factual resolution is, speculatively, the key to the factivity of the construction.

Resolved SOA's, in contrast, the denotation of declaratives, already represent a determinate picture of the world, which might or might not be factual.

We have suggested that embedded declaratives *can* be converted into claim-like entities, whereas this does not seem to be the case for embedded interrogatives. Why? The reason, one might speculate, is that creating a claim from a necessarily factual object is *redundant*: a claim can turn out to be a fact, a fact cannot turn out to be a claim. SOA's denoted by declarative sentences, on the other hand, carry no intrinsic factivity, and hence give rise to *bona fide* claims.

The relation MAXIMAL-FACTUAL-RESOLUTION

Recall that in chapter 1 we defined the instantiated answers of a given SOA as the resolved SOA's obtained from a question by assigning objects to the unfilled roles of the question:

(755) INST-ANS(σ,q) if and only if RESOLUTION(σ,q).

RESOLUTION relates a resolved SOA σ to any unresolved SOA q whose assignment function is extended by σ's role to entity assignment function.

For a SOA q_0, we define INST-ANS-LATT(q_0) to be the lattice obtained by closing the class of SOA's related to q_0 by the relation INST-ANS under SOA conjunction and disjunction, and partially ordered by the usual 'information subsumption' $\geq_{inf}$ that partially orders all SOA's ('entailment').

[9]Conversation with Paul King on this issue has been extremely useful for clarifying this for me.

We define EXIST-RESOLUTION(q_0) to be $\bigvee(INST-ANS-LATT(q_0))$, the greatest lower bound of INST-ANS-LATT(q_0). Intuitively this is the SOA that describes the outcome in which q_0 gets resolved positively, i.e. is instantiated in the case of wh-questions.

We define NEGATIVE-RESOLUTION(q_0) to be the SOA dual to EXIST-RESOLUTION(q_0) Intuitively this is the SOA that describes the outcome in which q_0 has no factual resolutions.

The relation MAXIMAL-FACTUAL-RESOLUTION relates q_0 to its strongest factual answer. This latter SOA will be the least-upper-bound of the lattice generated by the resolutions of q_0, if any such factual SOA's exist. If no such SOA exists, the strongest factual answer is $NEGATIVE-RESOLUTION(q_0)$:

(756) MAXIMAL-FACTUAL-RESOLUTION(σ_0, q_0) iff [($\sigma_0 = \bigwedge(INST-ANS(q_0))$) or ($\sigma_0 = NEGATIVE-RESOLUTION(q_0)$)] and $\exists s_0(s_0 \models \sigma_0)$

Some examples:

(757) a. For a wh-question q(x), its strongest factual answer will its maximal instantiated answer, if such exists. Otherwise, it will be the negative quantification over q(x).

b. For a yes/no interrogative 'Is it the case that p', its strongest factual answer will be p if p is factual. Otherwise it will be $\neg p$: this is because denoting the yes/no content with R(p), where R is an unfilled argument role for a modality, $\bigwedge(INST-ANS(R(p)))$ is exactly whichever of p or $\neg p$ is factual.

Since $NEGATIVE-RESOLUTION(q_0)$ is factual exactly when there is no factual SOA in INST-ANS(q_0), this ensures that any q_0 will have an entity that is its strongest answer. That is, there will always exist r, s_0 such that $s_0 \models$ ⟨ **MAXIMAL-FACTUAL-RESOLUTION**, resolver: r, resolved: q_0 ⟩ Thus, if we identify MAXIMAL-FACTUAL-RESOLUTION with COMPLETE-FACTUAL-RESOLUTION, we have established the desired well-definehood of the RI meaning.

7.6.2 Individuation

As we noted in chapter 1, RI complements are individuated with a grain as fine as QI complements. This is captured directly in the semantics we provide, since we make the question denoted by a QI use a constituent of the description denoted by the FI use. Thus, the RI complement meaning

(758) [VP]($dis-sit_0$) = λx $\exists r, s_0$ ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: r ⟩;
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S);
r: $s_0 \models$ ⟨ **COMPLETE-FACTUAL-RESOLUTION**, resolver: r, resolved: Skel-Cont(S) ⟩

is individuated with equal grain to the QI complement meaning

(759) [VP]($dis-sit_0$) = λx ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: Skel-Cont(S) ⟩;
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S)

The differential individuation capacity we gain arises by viewing the FI complement as a description, an instance of a solution first introduced by Russell to account for a somewhat different grain problem concerning definite NP's.

In so doing, we introduce a quantification over the answers to a question. One of the original motivations for introducing quantification is the ability it provides in explaining talk about arbitrary, non-familiar objects:

(760) Some person will win the race.

Thus, the sentence in (760) can be used to make a statement that concerns no *particular* individual.

It would appear that a similar point can be detected here, since asserting

(761) Bill knows who came.

can be used to make a statement that concerns no *particular* resolving answer to the question named by the interrogative sentence.

7.6.3 Semantic selection, Logical Form and Embedded questions

One additional consequence of the fact that QI/RI/claim embedding distinctions are semantically conditioned is an alternative solution to a phenomenon that has been claimed to provide a motivation for positing a syntactic level of LF. Huang 1982 observed that in Chinese, although no overt syntactic difference distinguishes the following embedded questions, their interpretations are identical with English equivalents that do show wh-movement:

(762) Zhangsan xiang-zhidao ta muqin kanjian shei.

---Zhangsan wonder his mother see who.
--'Zhangsan wondered who his mother saw.'

(763) Zhangsan xiangxin ta muqin kanjian shei.

---Zhangsan believe his mother see who.
--'Who did Zhangsan believe his mother saw.'

(764) Zhangsan zhidao ta muqin kanjian shei.

---Zhangsan know his mother see who.
--'Zhangsan knew who his mother saw.'
--'Who did Zhangsan know his mother saw.'

Huang's explanation for this is that in Chinese unary questions are derived by wh-movement at LF, rather than S-structure. Then, on the basis of a 'wh-criterion', which says roughly that every wh-phrase must be dominated by a +wh-COMP, and conversely every $+wh - COMP$ must dominate a wh-phrase, we have an account for both the English and Chinese facts, with the added assumption that 'wonder' subcategorises for a $+wh - COMP$, 'believe' for a $-wh - COMP$ and 'know' is compatible with both.

Given the current account, we can account for these facts without postulating syntactic ambiguity or ambiguity in the semantic predicate. The difference between

Chinese and English would lie in the fact that in Chinese, interrogative phrases are not specified for QUE, and consequently, are not constrained by the syntax to be absorbed at their surface sentential level, as QUE marked interrogatives in English are. The rest can be explained in semantic terms:

- If $V \in QI$ (e.g. 'wonder'), then the semantics forces the α-closure of the variable associated with the interrogative at the embedded level, otherwise the embedded complement will not have an interrogative content and will be inappropriate for the verb.

- If $V \in FI$,(e.g. 'know') both options are available: if the variable associated with the interrogative is closured at the embedded level, an RI interpretation for the complement arises. Otherwise, the variable corresponding to the wh-phrase is closured at the matrix level.

- If $V \in Claim-Embedders$, (e.g. 'believe'), the first option, applying α-closure at the embedded level will result in a complement that is inappropriate for the embedding predicate, whether it is a QI use or an RI use. Hence the only semantically felicitous possibility is to assign matrix scope to the variable.

Lappin 1991 has, independently, also proposed a semantic account for this phenomenon. The basic idea being that 'xiang-zhidao' ('wonder') requires a question denoting complement, 'xiangxin' ('believe') requires a propositional one, whereas 'zhidao' ('know') is *ambiguous* between the two possibilities. Hence, whether the wh-phrase is absorbed at the question embedding level follows from these assumptions: it must for 'wonder', it can't for believe, and is optional for 'know'. The difference between Lappin's account and the current one is that Lappin has to posit an ambiguity for the verb 'zhidao' ('know'), which correspondingly weakens the attraction of his proposal: Huang's syntactic ambiguity is thereby replaced by a problematic ambiguity, akin to that posited by Karttunen's semantics.

7.6.4 Exhaustiveness and Completeness

The way we defined **COMPLETE-FACTUAL-RESOLUTION** as **MAXIMAL-FACTUAL-RESOLUTION** enforces the exhaustiveness of the RI complement, which we have considered previously and concluded is not ultimately the right notion of 'resolving answer'. In fact, we suggested in section (7.2.2) that the proper notion is, plausibly, not definable in strict semantic terms, but is strongly dependent on pragmatic notions of what constitutes the resolution of an issue relative to a given agent and his purposes. This points to an advantage of the current approach to *responsehood*, which is not based on the assumption common to many past approaches that questions should be defined reductively in terms of their 'true and exhaustive' answers.

Intuitions on response felicity in a given context are decidedly crisp as compared with the vagueness of what constitutes a resolution of a question. Added to this the two notions seem to diverge markedly. In chapter 3, we showed that response-felicity could be grounded in a semantically based relation of answerhood, defined as a general relation on SOA's. This could be done precisely because on the current approach questions have been analysed in a *non-reductive* fashion.

Plausibly, then, the appropriate relation of 'resolving information' can, in principle, be defined to relate unresolved SOA to SOA's that, given certain pragmatic parameters constitute their resolution.

Appendix A

A Sample Fragment

A.1 Sentential Rules

A.1.1 Interrogative sentences

(765) a. S[fin,+INT][1] → (H,(VP[fin], TO-BIND | QUE([2]))), (C, NP[nom,INHER | QUE([2])]) [INHER | QUE] < X

b. [S]($dis - sit_0$) = α-CLOSURE(QUANT-CLOSURE(⟨ Skel-Cont(VP), Skel-Cont(NP) ⟩))
CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP);
$dis - sit_0 \models$ ⟨ α-SCOPING-POINT, [2], AT: [1] ⟩

(766) a. S[fin,+INT] [3] → (H,S[fin, INHER—SLASH([1]), TO-BIND—SLASH([1]), TO-BIND | QUE([2])]), (F,[1](INHER | QUE([2]))) [INHER-QUE] < X

b. [S]($dis - sit_0$) = $\alpha - CLOSURE$(Skel-Cont(H))
CONDITIONS-ON-VALUE: combine the Restr-Cont(H) with the Restr-Cont(F);
$dis - sit_0 \models$ ⟨ α-SCOPING-POINT, [2], AT: [3] ⟩

A.1.2 Declarative sentences

(767) a. S[fin,+DECL][1] → (H,(VP[fin]), (C, NP[nom])

S $(dis - sit_0)$ = α-CLOSURE(QUANT-CLOSURE(⟨ Skel-Cont(VP), Skel-Cont(NP) ⟩))
CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP)

(768) a. S[fin,+DECL] → (H,S[fin, INHER—SLASH([1]), TO-BIND—SLASH([1]]), (F,[1])

S $(dis - sit_0)$ = α-CLOSURE(Skel-Cont(H))
CONDITIONS-ON-VALUE: combine the Restr-Cont(H) with the Restr-Cont(F)

A.1.3 Reprise uses

(769) a. S[fin,+DECL][1] → (H,(VP[fin])), (C, NP[nom])

b. [S]$(dis{-}sit_0, reprise{-}force_0, reprised{-}speaker_0)$ = REPRISE-α-$CLOSURE$(Quant-CLOSURE(⟨ Skel-Cont(VP), Skel-Cont(NP) ⟩))
CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP);$dis - sit_0$ |= ⟨ REPRISING, S, $reprise - force_0$, $reprised - speaker_0$ ⟩

(770) a. S[fin,+DECL][2] → (H,S[fin, INHER—SLASH([1]), TO-BIND—SLASH([1])]), (F,[1])

S $(dis{-}sit_0, reprise{-}force_0, reprised{-}speaker_0)$ = REPRISE-α-CLOSURE(Skel-Cont(H))
CONDITIONS-ON-VALUE: combine the Restr-Cont(H) with the Restr-Cont(F); $dis - sit_0$ |= ⟨ REPRISING, [2], $reprise - force_0$, $reprised - speaker_0$ ⟩

A.1.4 Alternative sentence rule

(771) a. S[fin,+DECL] → (H, (VP[+INV])), (C, NP[nom])

S $(dis - sit_0)$ = α-CLOSURE(QUANT-CLOSURE(⟨ Skel-Cont(VP), Skel-Cont(NP) ⟩))

CONDITIONS-ON-VALUE: combine the Restr-Cont(NP) with the Restr-Cont(VP)

A.1.5 Declarative embedding

(772) a. VP[fin] → (H, V[fin]), (C, S[+DECL])

b. [VP]($dis - sit_0$) = λx ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: Skel-Cont(S) ⟩;
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S)

c. [VP]($dis - sit_0, claim - situation_0$) = λx ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: Claim($claim - situation_0$, Skel-Cont(S)) ⟩;
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S).

A.1.6 Interrogative embedding

(773) a. VP[fin] → (H,V[fin]), (C, S[+INT])

b. [VP]($dis - sit_0$) = λx ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: Skel-Cont(S) ⟩;
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S)

c. [VP]($dis - sit_0$) = λx $\exists r, s_0$ ⟨ Skel-Cont(V), cognitive-ag: x, object-of-cognizing: r ⟩;
CONDITIONS-ON-VALUE: Combine the Restr-Cont(V) with the Restr-Cont(S); r: s_0 |= ⟨ **COMPLETE-FACTUAL-RESOLUTION**, resolver: r, resolved: Skel-Cont(S) ⟩

A.1.7 VP rule

(774) a. VP[fin] → V[fin],NP

b. [VP]($dis - sit_0$) = λx ⟨ Skel-Cont(V), subj-role:x,
obj-role: Skel-Cont(NP) ⟩;
CONDITIONS-ON-VALUE: Restr-Cont(V) conjoined with Restr-Cont(NP).

A.2 Semantic Operations and principles

A.2.1 Quantificational closure

(775) QUANT-CLOSURE(A_0, σ) = $\exists Skel - Cont(a_1), \ldots \exists Skel - Cont(a_{i-1})$
⟨ $QUANT - FORCE(a_i), RESTR - TERM(a_i)$, $\lambda Skel - Cont(a_i) \exists Skel - Cont(a_{i+1}), \ldots, \exists Skel - Cont(a_{i+j_i})$
⟨ $QUANT - FORCE(a_n), RESTR - TERM(a_n)$, $\lambda Skel - Cont(a_n) \exists Skel - Cont(a_{n+1}), \ldots, \exists Skel - Cont(a_{n+j_n})$ σ ⟩ ...⟩ where $a_1, \ldots, a_{n+j_n}$ is the longest sequence of NP sub-utterances of A_0 such that for any i ⟨SCOPING-POINT, a_i, AT: a_{i+1} ⟨SCOPING-POINT, a_{n+j_n}, AT: A_0 ⟩

A.2.2 α-abstraction and closure

(776) $\alpha x_1, \ldots, x_n$ ⟨ Q, ... $r_1 : x_1$, ..., $r_n : x_n$ ⟩ $=_{def}$
⟨ λ $x_1, \ldots, x_n$ ⟨ Q, ... $r_1 : x_1$, ..., $r_n : x_n$ ⟩, x_1:–,...,x_n:– ⟩

(777) α-CLOSURE(A_0, σ) = $\alpha P(a_1), \ldots, P(a_n)\sigma$, where $a_1, \ldots, a_n$ is the longest sequence of NP sub-utterances of A_0 such that for any i, EITHER ⟨ α-IND-SCOPING-POINT, a_i, AT: A_0 ⟩ and $P(a_i)$ = Skel-Cont(a_i)
OR ⟨ α-DEPENDENT-SCOPING-POINT, a_i AT:A_0 ⟩ and
∃ z⟨ DEPENDENCY, $P(a_i)$, a_i, z ⟩

A.2.3 Reprise-α-Closure

(778) REPRISE-α-CLOSURE(A_0, σ) = $\alpha Q(b_i), \ldots Q(b_m)$ ⟨ $reprise-force(A_0)$, repriser: $reprised - speaker(A_0)$
reprised-content: $\alpha P(a_1), \ldots, P(a_n)$ σ ⟩,
WHERE $b_i, \ldots, b_m, a_1, \ldots, a_n$ is the longest sequence of NP sub-utterances of

A_0 such that for each j, $0 \leq j \leq m$, $Q(b_i)$ = Skel-Cont(b_i)
and ⟨ REPRISE, b_i, AT:A_0 ⟩ and for any i, EITHER ⟨ α-IND-SCOPING-POINT, a_i, AT: A_0 ⟩ and $P(a_i)$ = Skel-Cont(a_i)
OR ⟨ α-DEP-SCOPING-POINT, a_i AT:A_0 ⟩ and $\exists$ z⟨ DEPENDENCY, $P(a_i)$, a_i z ⟩

A.2.4 The Absorption principle

If y depends on x and x has been absorbed (i.e. abstracted over or existentially quantified away), then y must be existentially quantified away.

A.3 Lexicon

A.3.1 Verbs

(779) a. V → walk

b. ['walk']($dis - sit_0$) = WALK.
CONDITIONS-ON-VALUE: (none).

(780) a. V → see

b. ['see']($dis - sit_0$) = SEE.
CONDITIONS-ON-VALUE: (none).

(781) ['You']($dis - sit_0$) = s.
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ ADDRESSED-WITH 'You', s ⟩.

A.3.2 Referential uses

(782) a. NP → I;

b. ['I']($dis - sit_0$) = t.
CONDITIONS-ON-VALUE: $disit_0 \models$ ⟨ UTTERING, 'I', t ⟩.

(783) ['Jill']($dis - sit_0, naming - sit_0$) = t;
CONDITIONS-ON-VALUE: t: $dis - sit_0$ |= ⟨ REFERRED-TO,'Jill',t ⟩, $naming - sit_0$ |= ⟨ NAMED, 'Jill',t ⟩.

(784) ['The table']($dis - sit_0, uniqueness - sit_0$) = t;
CONDITIONS-ON-VALUE: t: $dis - sit_0$ |= ⟨ REFERRED-WITH, 'the table', t ⟩, $uniqueness - sit_0$ |= ⟨ TABLE, t ⟩;
$uniqueness - sit_0$: ⟨ UNIQUE, TABLE, $uniqueness - sit_0$ ⟩

(785) ['A table']($dis - sit_0, domain - sit_0$) = t;
CONDITIONS-ON-VALUE: t: $dis - sit_0$ |= ⟨ REFERRED-WITH, 'a table', t ⟩, $domain - sit_0$ |= ⟨ TABLE, t ⟩;

A.3.3 Quantificational uses

(786) ['A table']($dis - sit_0, domain - sit_0, scope - of - use_0$) = t;
CONDITIONS-ON-VALUE: t: $dis - sit_0$ |= ⟨ SCOPING-POINT, 'a table', AT: $scope - of - use_0$ ⟩; $domain - sit_0$ |= ⟨ TABLE, t ⟩

(787) ['Each man']($dis - sit_0, domain - sit_0, scope - of - use_0$) = t: Quant-Force: EACH. Restr-Term:MAN;
CONDITIONS-ON-VALUE: t: $dis - sit_0$ |= ⟨ SCOPING-POINT, 'each man', AT: $scope - of - use_0$ ⟩

A.3.4 Independent uses of interrogatives:

(788) ['Who']($dis - sit_0, domain - sit_0, absorption - point_0$) = t;
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ α-IND-SCOPING-POINT,'who', AT: $absorption - point_0$ ⟩; t: $domain - sit_0$ |= ⟨ PERSON, t ⟩;

(789) ['What']($dis - sit_0, domain - sit_0, absorption - point_0$) = t;
CONDITIONS-ON-VALUE: $dis - sit_0$ |= ⟨ α-IND-SCOPING-POINT,'who', AT: $absorption - point_0$ ⟩; t: $domain - sit_0$ |= ⟨ INANIMATE, t ⟩

(790) ['Which table'](*dis* − sit_0, *uniqueness* − sit_0, *absorption* − $point_0$) = t;
CONDITIONS-ON-VALUE: *dis* − sit_0 |= ⟨ α-IND-SCOPING-POINT,'which table', AT: *absorption* − $point_0$ ⟩; t: *uniqueness* − sit_0 |= ⟨ TABLE, t ⟩; *uniqueness* − sit_0: ⟨ UNIQUE, TABLE, *uniqueness* − sit_0 ⟩

(791) ['John or Bill'](*dis* − sit_0, *uniqueness* − sit_0, *absorption* − $point_0$) = t;
CONDITIONS-ON-VALUE: *dis* − sit_0 |= ⟨ α-IND-SCOPING-POINT,'John or Bill', AT: *absorption* − $point_0$ ⟩; t: *uniqueness* − sit_0 |= ⟨ IDENTICAL-TO-(**john** or **bill**), t ⟩; *uniqueness* − sit_0: ⟨ UNIQUE, IDENTICAL-TO-(**john** or **bill**), *uniqueness* − sit_0 ⟩

A.3.5 Dependent uses

(792) ['its tail'] (*dis* − sit_0, *role* − $antecedent_0$) = s;
CONDITIONS-ON-VALUE: s: ⟨ TAIL, s ⟩, ⟨ POSSESSION, poss-er:t,poss-ee:s ⟩; t: *uniqueness* − sit_0 |= ⟨ INANIMATE, t ⟩; *uniqueness* − sit_0: ⟨ UNIQUE, INANIMATE, *uniqueness* − sit_0 ⟩, ⟨ |=, *uniqueness* − sit_0 ⟨ DEPENDENCY, =, 'its tail', *role* − $antecedent_0$ ⟩ ⟩

(793) ['a local bar'] (*dis* − sit_0, *role* − $antecedent_0$) = s;
CONDITIONS-ON-VALUE: s: ⟨ BAR, s ⟩, ⟨ LOCAL-TO, location:t, pred-obj:s ⟩; t: *uniqueness* − sit_0 |= ⟨ LOCATION, t ⟩; *uniqueness* − sit_0: ⟨ UNIQUE, LOCATION, *uniqueness*−sit_0 ⟩ ⟨ |= *uniqueness*−sit_0, ⟨ =, t, *role*−$antecedent_0$ ⟩ ⟩

(794) ['Which table'](*dis* − sit_0, *domain* − sit_0, *absorption* − $point_0$, *role* − $antecedent_0$) = t;
CONDITIONS-ON-VALUE: *dis* − sit_0 |= ⟨ α-DEP-SCOPING-POINT, 'which table' AT: *absorption*−$point_0$ ⟩ t: *uniqueness*−sit_0 |= ⟨ TABLE, t ⟩; *uniqueness* sit_0: ⟨ UNIQUE, TABLE, *uniqueness* − sit_0 ⟩, ⟨ |=, *uniqueness* − sit_0 ⟨ DEPENDENCY, h, 'which table', *role* − $antecedent_0$ ⟩ ⟩

A.3.6 Reprise use

(795) [WHO]($dis - sit_0, domain - sit_1$) = t,
CONDITIONS-ON-VALUE: $dis - sit_0 \models$ ⟨ REPRISE, 'whom', AT: 'Bill likes WHO' ⟩; t: $domain - sit_1 \models$ ⟨ PERSON, t ⟩

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