Book Title

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Current Research in the Semantics/Pragmatics Interface

WHERE SEMANTICS MEETS PRAGMATICS:
THE MICHIGAN STATE UNIVERSITY PAPERS

Klaus von Heusinger and Ken Turner (eds.)

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PREFACE

This book is a collection of original research articles on the semantics-pragmatics interface. The articles engage with such topics as nominal references, bare nouns, generics, quantification, information structure and mood, as well as more general strategic matters in approaching the interdigitation of meaning and use. In addition to the theoretical contributions to the question of the semantics-pragmatics interface, many papers contribute crosslinguistic data and analyses to these issues. The roots of this book lie in the workshop "Where Semantics meets Pragmatics", which was held as the First International Workshop on Current Research in the Semantics-Pragmatics Interface at Michigan State University in July 2003 as part of the Linguistic Society of America Summer Institute. The purpose of the workshop was to bring together some of the principal researchers on theories that aim to clarify the nature of the semantics-pragmatics interface. The papers presented at the workshop represent state of the art research on theoretical and descriptive issues. The discussions during, and indeed after, the workshop showed the fruitfulness of combining theoretical approaches with descriptive analyses, and brought a number of new and original questions into focus.

The authors and editors have profited immensely from the presentation and comments by the other participants of the conference, and the anonymous reviewers for each of the papers. The workshop would not have been possible without the generous help and support of Barbara Abbott to whom we owe many thanks. She continuously supported us, very efficiently and courteously, from our early planning in 2001 to the date of the workshop and beyond, with the administrative and organizational matters. We would also like to thank our student assistant at Michigan, Matt Husband, who made the day to day running of the workshop even more comfortable by managing matters behind the scenes. We are also enormously grateful to Hans Kamp, Larry Horn, Bill Ladusaw, and Nick Asher, for accepting our invitation to this workshop, and all participants for their contributions, their fruitful interaction and their enthusiasm, all of which made this workshop not only a very interesting but also a very congenial event.

We would like to thank the external reviewers for their detailed and constructive reviews of each of the papers. A very special thanks goes to Ralf Jankowitsch, whose tireless, but always patient and professional, efforts not only produced the coherent layout of the book but also helped enormously to correct minor mistakes and typos in the particular papers. We thank the Chair of the Research Support Fund of the University of Brighton, Stuart Laing, for much appreciated financial assistance. Finally, we would like to express our sincerest gratitude to all our colleagues who have contributed to this volume for their enthusiasm in contributing to the analytical exploration and conceptual explication of the semantics-pragmatics interface.

Klaus von Heusinger
Ken Turner

Brighton and Stuttgart, July 2005

(BY WAY OF AN) INTRODUCTION: A FIRST DIALOGUE ON THE SEMANTICS-PRAGMATICS INTERFACE

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> The subject is full of perplexities,
> but I think that our troubles arise from
> a failure to recognise that different parts
> of our language have meaning in different ways.
> (Kneale 1949:89)

P. Well, I think that Kneale is right, but I would suggest that what Cohen (1971, 1977) has called the Conversational Hypothesis be employed to confront some of these perplexities. The distinction between 'sense' and 'implicature' (both are terms of art, of course, but the scare quotes ought to keep us on our toes) is of enormous use. And the accompanying recommendations, that (a) senses not be multiplied beyond necessity and (b) 'it is more generally feasible to strengthen one's meaning by achieving a superimposed implicature, than to make a relaxed use of an expression' (Grice 1989:48), though not without their problems, both serve to define a potentially useful methodology.

S. Yes, I think I would agree, but your terms of art need to be firmed up a little. Stalnaker is helpful:

> Semantics, as contrasted with pragmatics, can mean either the study of *meaning* or the study of *content*. The contrast between semantic and pragmatic claims can be either of two things, depending on which notion of semantics one has in mind. First, it can be a contrast between claims about the particular conventional meaning of some word or phrase on the one hand, and claims about the general structure or strategy of conversation on the other. Grice's distinction between conventional implicatures and conversational implicatures is an instance of this contrast. Second, it can be a contrast between claims about the truth-conditions or *content* of what is said – the proposition expressed – on the one hand, and claims about the *context* in which a statement is made – the attitudes and interests of speaker and audience – on the other. (Stalnaker 1974:212).

I like this quote. It highlights an ambiguity in the word 'semantics' that too often goes unrecognised. It foreshadows some later work. And it also pushes attention to someone who seems to have fallen victim to that ambiguity. Grice, an early defender of the Conversational Hypothesis, seems to have, on several occasions, wanted to endorse an intention-based approach to conventional meaning, and, on other occasions – his defence of the propositional connectives, for example – a truth-functional approach to content. It is, I think, little wonder that the William James Lectures are so difficult to interpret (cf. Neale 1992; Cosenza 2001; Chapman 2005).

P. Yes, Stalnaker was always ten years ahead of the pack. And you are right about Grice. But it is possible to go a little further. The notion of conventional meaning in his work, as well as in the work of others, is almost completely undefined. Let me return a quote:

> The claims for the explanatory power of Gricean principles of conversational inference rest upon a highly convincing if vague account of the RELATIONSHIP between the CONVENTIONAL MEANING of the IMPLICANS, its conversational role, and the resulting IMPLICATA. But for words and sentences the theory posits CONVENTIONAL MEANINGS that are controversial, while seeming to assume that the adequacy of such posits of conventional word/sentence-meaning can never be tested directly, but – and this is a truism in the theory – only by their contribution to the speaker's utterance-meaning of words and sentences uttered in contexts of actual use. The theory's great success is its convincing explanation of how and what speakers are understood to mean when patently they do NOT mean what their words conventionally do. . . . the account is enlightening. But how much CAN this kind of theory tell us about the ACTUAL conventional meanings of English expressions? (Atlas 1979:270).

Atlas (1989, 2005) has subsequently developed a theory of semantic underspecification. And this bring us up to the present.

S. How's that, exactly?

P. Well, I'm thinking of the number of models that seem to be indebted both to Stalnaker's observation and to Atlas's efforts.

S. Go on, explain a little more.

P. OK. The current fashion seems to be for models that have a number of different kinds of semantics, each of them associated with their own pragmatics. Let's take a concrete example.

S. OK.

P. A template that seems to be common to a number of theories includes (a) some reference to linguistic meaning; (b) some account of truth-conditional meaning and (c) some calculation of contextual, or pragmatic, meaning. Different theories differ on the 'size' of (a), (b) and (c) and what they assume 'mediates' between these different domains.

S. Does Relevance Theory employ this template?

P. Well, yes, but I prefer to keep Relevance Theory out of the frame.

S. Why's that?

P. Well, consider the following quote:

> The principle of relevance differs from every other principle, maxim, convention or presumption proposed in modern pragmatics in that it is not something that people have to know, let alone learn, in order to communicate effectively; it is not something that they obey or might disobey: it is an exceptionless generalisation about human communicative behaviour.

This quote appears in numerous places in the relevance theory literature (Sperber & Wilson 1986a:160; Wilson & Sperber 1988:140; Wilson & Sperber 1992:68). Something close to it appears in both editions of their book:

> The principle of relevance . . . is a generalisation about ostensive-inferential communication. Communicators and audience need no more know the principle of relevance to communicate than they need to know the principles of genetics to reproduce. Communicators do not 'follow' the principle of relevance; and they could not violate it even if they wanted to. The principle of relevance applies without exception: every act of ostensive communication communicates a presumption of relevance. (Sperber & Wilson 1986b:162; Sperber & Wilson 1995:162).

S. I think I can see where this going.

P. Right. The principle of relevance, we are told, is an exceptionless generalisation. But being exceptionless suggests something stipulative, whereas being a generalisation suggests something empirical. Look at it this way: suppose you have seen one hundred swans and they all have been white. You can say 'All swans are white'. Then you see a black swan and your generalisation is now false. It has to be revised in some way. Compare that with another case: suppose you have seen one hundred swans and they all have been white. You can say 'All swans are white'. Then you see a 'black swan'. What do you do? Well, under the stipulation you point to the 'black swan' and you say 'That's not a swan'. Being a stipulation and being an empirical generalisation are two quite different things.

S. So Relevance Theory rests upon a category mistake.

P. I think so, yes.

S. It's almost a replay of Ryle versus Descartes.

P. It would appear so, yes.

S. Doesn't the 'Postface' (in Sperber & Wilson 1995:255–279) go some way to diminishing that objection. After all, in the 'Postface' they introduce some revisions – one of which is the distinction between (a) a cognitive principle of relevance and (b) a communicative principle of relevance. (a) states that human cognition tends to be geared to the maximization of relevance and (b) states that every act of communication communicates a presumption of its own optimal relevance. I think they call (a) the principle of relevance and (b) the presumption of relevance.

P. No, I don't think the revision helps. They go on to say that "[t]he change is, of course, expository and not substantive" (Sperber & Wilson 1995:261) so the original objection stands.

S. Yes, I think you are right, and we could add that a bit later they say something rather surprising.

P. What are you thinking of?

S. Well, later on they say:

> . . . neither the principle nor the presumption of relevance is presented as a goal to be pursued or a rule to be followed by the communicator. The (Second) Principle of Relevance is a descriptive (as opposed to normative) claim about the content of a given act of ostensive communication. It claims that part of that content is a presumption that this very act of communication is relevant to the addressee. (Sperber & Wilson 1995:271).

P. Yes, that's puzzling. I conclude from this that the First Principle of Relevance (and I don't know why it has grown capital letters) is most probably, in their eyes at least, exceptionless and that the Second Principle (or Presumption) of Relevance is a generalization. They don't say that this is what they mean but this interpretation might help to get them out of a hole. The whole thing is far from clear, though.

S. But, if I am not mistaken, there is another, how shall we say, infelicity in the theory.

P. What are you thinking of here?

S. Well, as I understand it, Relevance Theory assumes that speakers and hearers are equipped with a grammar, a logic, an encyclopaedia or memory and the principle of relevance.

P. Yes, that's what I understand too.

S. Now, the logic part of this is a bit puzzling. The theory claims that the logic is deductive, but that it is restricted to elimination rules. You know, you can infer P or Q from $P \wedge Q$, by $\wedge$-elimination, but you can't infer $P \wedge Q$ from P and Q, because that step requires $\wedge$-introduction.

P. Yes, the theory requires that because with introduction rules, chains of inferences might never to come to an end. With $\vee$-introduction, for example, you can go from P to $P \vee Q$ to $(P \vee Q) \vee R$ and so on.

S. But what I don't understand, if the logic is deductive and eliminative, is how one can, using the principle of relevance, infer the propositional content from an underspecified linguistic meaning. Deductive rules operate on truth carrying propositions and they preserve truth. Deductive rules cannot operate on sub-propositional linguistic meanings because these things, whatever they are, are not true or false.

P. Yes, and to anticipate a bit, let me quote Levinson on this matter:

> . . . owing to its explicit commitment to deductive reasoning, Relevance Theory appears especially incoherent: "no assumption is simply decoded [from an utterance], and . . . the recovery of any assumption requires an element of inference" (Sperber & Wilson 1986b:182). But how are we to get from nonlogical forms to further contextual implications that will enrich them by a deductive process that can only handle logical forms? Theories that are abductive or inductive in character, or that are phrased in terms of an inference to the best explanation,

> may not face this theoretical incoherence, but of course that does not erase the *computational* problem. (Levinson 2000:257).

S. So my observation has already been anticipated?

P. Yes, but the point deserves to be repeated.

S. The overall Relevance Theory position has changed a little bit, though, recently, if I have been correctly informed.

P. Well, you are right. The linear nature of the model – starting with logical form, then augmenting logical form into truth-conditional content with some application of the principle of relevance, then adding to content (or explicature, as we should now say), again with some application of the principle of relevance, to derive implicatures – has changed into a parallel model. Here's Carston:

> The mechanism that mediates the inferences from logical form to communicated propositions is one of 'mutual parallel adjustment' of explicatures and implicatures, constrained by the comprehension strategy. The result should consist of (sets of) premises and conclusions making up valid arguments, but *the important point is that the process need not progress strictly logically* from the accessing of premises to the drawing of conclusions. For instance, a particular conclusion, or type of conclusion, might be expected on the basis of considerations of relevance and, via a backwards inference process, premises constructed (explicatures and implicatures) which will make for a sound inference to the conclusion. The process may involve several backwards and forwards adjustments of content before an equilibrium is achieved which meets the system's current 'expectation' of relevance. (Carston 2002:139).

I've added a little emphasis.

S. Is it really 'sound inference' that is meant here, or 'valid inference'?

P. I don't really know – nor do I really know what a 'backward inference' is.

S. OK. I can see why you want to keep Relevance out of the frame.

P. OK.

S. So what does fit the template that you mention?

P. Well, let's try Truth Conditional Pragmatics.

S. OK. What's that?

P. Let me quote a version. (This is a bit long but it's as well to stick to the originals).

> . . . there are several **levels** of meaning. When an utterance is made, the sentence-type that is uttered possesses a linguistic meaning (level 1). More often than not, that meaning is not a complete content: to get a complete content, one must resolve indeterminacies, assign values to indexical expressions, etc. The richer meaning thus determined is the literal content of the occurrence which depends not merely upon the conventional significance of the expression-type, but also on features of the context of use (level 2). At level 3, we find aspects of meaning that

> are not part of the literal content of the utterance. Those aspects of meaning are not aspects of what is said. Rather, the speaker manages to communicate them indirectly, BY saying what she says. Conversational implicatures and indirect speech acts fall into that category. This division into three levels – linguistic meaning, literal content, and conveyed meaning – is incomplete and very rough, but it will do for my present purposes. (Recanati 2004b:457).

I endorse that last sentence.

S. This seems to be a very full statement of the template that you mentioned.

P. Yes, what distinguishes, I think, Truth Conditional Pragmatics from, say, Relevance Theory, is that there are different kinds of pragmatics mediating between linguistic meaning and literal content, on the one hand, and literal content and conveyed meaning, on the other.

S. Relevance Theory claims that the principle of relevance does both jobs.

P. Yes.

S. But we have seen that the principle of relevance is designed in a rather general fashion and it is surprising if it is able to do anything at all.

P. Yes, Truth Conditional Pragmatics posits two kinds of pragmatic processes – primary and secondary.

S. What's the difference?

P. Well, and I have to preface any remarks with the words 'As I understand it…'

S. I know what you mean.

P. As I understand it…as I understand it …erm …as I understand …oh dear, I've lost it again. Let me go back to the original.

S. OK.

P. Here goes:

> I distinguish between two sorts of pragmatic process. The contextual processes which are (subpersonally) involved in the determination of what is said I call *primary* pragmatic processes. In contrast, *secondary* pragmatic processes are ordinary inferential processes taking us from what is said, or rather from the speaker's saying of what is said, to something that (under standard assumptions of rationality and cooperativeness) follows from the fact that the speaker has said what she has said. To the extent that the speaker overtly intends the hearer to recognize such consequences as following from her speech act, they form an integral part of what the speaker means by her utterance. That is, roughly, Grice's theory of 'conversational implicature' (Grice 1989). An essential aspect of that theory is that the hearer must be able to recognize what is said and to work out the inferential connection between what is said and what is implied by saying it. Again, it follows that what is said must be consciously available to the interpreter. It must satisfy what I call the Availability constraint. (Recanati 2004c:51; cf Recanati 2004a:17).

Or again: (sorry to go on but I find this position rather puzzling and I'm hoping you will be able to infer the overall perspective from a number of quotes).

S. OK. Let's have it.

P. > The determination of what is said takes place at a sub-personal level, much as the determination of what we see. But the determination of what the speaker implies takes place at the personal level, much like the determination of the consequences of what we see. (Seeing John's car, I infer that he did not leave). The crucial fact is that pragmatic, background-dependent processes may well take place at a sub-personal level in an automatic and non-reflective manner. Such processes are not 'inferential' in the strong sense in which secondary pragmatic processes are inferential. (Recanati 2002:114).

S. OK. But make that a little more concrete for me. Hang some examples on it.

P. Well, on the assumption that secondary pragmatic processes are not too distant from the familiar Gricean sort of things, I think we only need to talk about the primary pragmatic processes. Would that be fair?

S. I think so, yes.

P. So, these processes contribute to the constitution of literal meaning or 'what is said'. Some examples that are used to illustrate this constitution include (linguistic meaning) 'I have nothing to wear' which is transformed into (truth conditional/literal meaning) 'I have nothing suitable to wear for this evening' and (linguistic meaning) 'I have had breakfast' which is transformed into (truth conditional/literal meaning) 'I have had breakfast today'.

S. I think I am getting the idea. But what does Truth Conditional Pragmatics 'take to the bank', as the Americans say?

P. Hmm, that's none too clear. In Truth Conditional Pragmatics such terms as 'expansion', 'strengthening' and 'enrichment' are used to label the kinds of processes that have these kinds of effects, but such labels are only defined ostensively and I have to admit that I do not find such definitions entirely helpful. It's not always easy to tell these processes apart.

S. And what about the Availability Constraint?

P. Well, in Truth Conditional Pragmatics it is assumed that the content of truth conditional meaning, unlike linguistic meaning, is consciously available. Back to the originals:

> *Availability Principle*: In deciding whether a pragmatically determined aspect of utterance meaning is part of what is said, that is, in making a decision concerning what is said, we should always try to preserve our pre-theoretic intuitions on the matter. (Recanati 1989:310).

S. Erm, wait a minute. Who does the 'our' refer to in that quote?

P. Well, it had previously been remarked that this

> presupposes that what is said by an utterance is available or acceptable to the unsophisticated speaker-hearer. 'Available' must be understood here in a strong sense: what I mean is not that what is said by an utterance is tacitly identified at some sub-doxastic level, but that it is accessible to our ordinary, conscious intuitions. (Recanati 1989:310).

S. That sounds like the sort of claim that ought to be put under experimental examination. I've been browsing through Noveck & Sperber (2004), without, I should add, coming to any firm conclusions just yet.

P. And Truth Conditional Pragmatics is coming in for a more general examination in Frápolli (forthcoming). Until then, Bezuidenhout (2002) is not too bad a read.

S. Are there any other theories that posit three levels of meaning?

P. Well, it's funny that you should use that expression – three levels of meaning – as that is the title of a very interesting paper (Levinson 1995) that introduces the Theory of Generalized Conversational Implicature.

S. What's the idea here?

P. The Theory of Generalized Conversational Implicature, or TGCI from now on, is a theory of utterance-*type* meaning, as distinct from a theory of utterance-*token* meaning. The idea is that there are implicatures which are relatively steady across contexts. Take a couple of examples, both from Levinson (1995) (where PCI is short for 'particularized conversational implicature' and GCI for 'generalized conversational implicature'):

Context 1. A: What time is it?
B: Some of the guests are already leaving.
PCI: It must be late.
GCI: Not all of the guests are leaving.

Context 2. A: Where's John?
B: Some of the guests are already leaving.
PCI: Perhaps John is already leaving.
GCI: Not all of the guests are leaving.

S. OK. These are nice examples. I can see that certain inferences are relatively context free. But where does the theory say these inferences come from?

P. It's claimed there are three heuristics which license these readings. There is the Q-heuristic, which states that 'what isn't said to be the case is not the case'. The GCIs in Contexts 1 and 2 arise from this heuristic. Second, there is the I-heuristic, which states that 'what is said in a simple, or unmarked, way represents a stereotypical situation' and finally there is the M-heuristic which states that 'what is said in an abnormal, or marked, way represents an abnormal situation'.

S. OK, and just for concreteness, what would be illustrative examples of I and M?

P. Well, we can take some examples straight from Levinson again. (This time his 2000:141):

1. Larry stopped the car.
   I-implicates that Larry caused the car to stop in the normal way, by using the foot pedal, whilst
2. Larry caused the car the stop.
   M-implicates that Larry caused the car to stop in a nonstereotypical way, e.g., by using the emergency brake or by running it into a pillar box.

S. We'll be hearing from Larry a little later, I think.

P. Yes. He's the first up. Or:

> 3. The Spanish killed the Aztecs.
> I-implicates that the Spaniards slaughtered the Aztecs directly, whereas
> 4. The Spanish caused the Aztecs to die.
> M-implicates that the Spanish killed the Aztecs, by, for example, disease or hard labour.

S. This is all very interesting.

P. Yes, I think so. At least the TGCI is a lot more *explicit* than Truth Conditional Pragmatics. I'm still impressed by those few lines that one finds in the Preface to *Syntactic Structures*.

S. What are those?

P.

> Precisely constructed models for linguistic structure can play an important role, both negative and positive, in the process of discovery itself. By pushing a precise but inadequate formulation to an unacceptable conclusion, we can often expose the exact source of this inadequacy and, consequently, gain a deeper understanding of the linguistic data. (Chomsky 1957:5).

S. I agree entirely.

P. But there is something more in the TGCI that we should dwell upon.

S. What's that?

P. Well, something called 'pragmatic intrusion'.

S. I think I know about that. It's when, in cases like comparatives and conditionals, implicatures contribute to truth-conditions.

P. That's right.

S. Although the name is not particularly felicitous.

P. How do you mean?

S. Well, Levinson, for example, talks about intrusive constructions (e.g., Levinson 2000:198–217), but this name suggests that it is the constructions themselves which are intrusive but, in fact, the constructions are intruded upon. They are the recipients of intrusion, not the perpetrators of it.

P. Yes, this point has already been made:

> The label 'intrusive construction' seems an odd usage to me, since the point surely is, not that these constructions are themselves intrusive, but rather are 'intruded upon' by pragmatically inferred meaning, that is, they are 'pragmatically penetrable'. (Carston 2004:81 fn5).

S. So my observation, once again, has already been anticipated?

P. Yes, but the point merits repetition. As does the point about the facts of intrusion having far-reaching consequences for the architecture of a theory of the semantics/pragmatics interface. Levinson says:

> There is every reason then to try and reconstrue the interaction between semantics and pragmatics as the intimate interlocking of distinct processes, rather than, as traditionally, in terms of the output of the one being the input of the other. (Levinson 2000:242).

S. But one can go back a little bit.

P. Where to?

S. Well, Levinson had earlier, in a discussion of discourse representation and theories designed to account for that, introduced an evocative metaphor:

> . . . there is a common slate, a level of propositional representation, upon which both semantics and pragmatics can write – the contributions may be distinguished, let's suppose, by the color of the ink: semantics in black, pragmatics in red. Semantics and pragmatics remain modular "pens" as it were: they are separate devices making distinctively different contributions to a common level of representation. (Levinson 2000:193).

P. So *that's* where semantics meets pragmatics – on the common slate.

S. Maybe, yes.

P. I like that metaphor.

S. So do I. But it should not be forgotten that there is an alternative.

P. I think I know what you are going to say.

S. Well, I'm impressed by the following bit of honesty:

> There will always be doubts about whether a better semantic analysis of the relevant construction might not accommodate the apparent pragmatic intrusions in some other way. (Levinson 2000:214).

P. Yes, that's what I thought you were going to say.

S. And, in fact, there has recently been an attempt to deal with these facts in some other way.

P. You mean King & Stanley (2005).

S. Yes, there is no need to rehearse their arguments here, but they do provide a plausible account that gives a little more descriptive and analytical priority to semantics. Their argument is especially interesting because the semantic/pragmatic analysis is embedded in the context of a discussion of what *philosophers* should be understood to mean when they talk, in epistemology, for example, about what knowledge claims like 'I know' mean.

P. There is a lot more that one could say, of course.

S. Well, there is. We could go back to Stalnaker and discuss his project of a formal pragmatics.

P. Yes, our discussion has been a little informal so far.

S. Yes, Stalnaker recommends that a formal pragmatics be based on possible worlds:

> Formal pragmatic theory begins, as do the semantic theories that have been most fruitfully applied to natural languages, with possible worlds. Possible worlds semantics is an appropriate framework for pragmatic theory, not just because it has proved to be an elegant, flexible and technically fruitful apparatus, but because it makes possible an explanation of content and context in terms of an essential feature of discourse, and more generally of rational activity. It is a common, and I think defining feature of rational activities . . . that they involve agents distinguishing among alternative possibilities. (Stalnaker 1981:441).

P. Put me straight if I am wrong but possible worlds don't seem to have, how shall we say, big box office these days.

S. No, they don't. Some years ago the following minimal pair was noticed:

5. (a) Exactly one of the ten marbles is not in the bag.
   (b) It is under the sofa.
6. (a) Exactly nine of the ten marbles are in the bag.
   (b) It is under the sofa.

These examples were first noticed by Barbara Partee and first reported in (Heim 1982:21).

P. And what conclusions does this pair point to?

S. Well, the third person singular pronoun in 5(b) is understood as referring to the marble not in the bag but the pronoun in 6(b) is not so understood. Therefore, 5(a) and 6(a) must provide different kinds of contexts for 5(b) and 6(b). But the sentences 5(a) and 6(a) are compatible with exactly the same set of possible worlds. The conclusion is therefore that possible worlds are not sufficiently fine-grained for an adequate analysis of this kind of data. Kamp is very clear on the matter:

> We must conclude that no differences [between 5(a) and 6(a), S] can be predicted if contexts are identified with sets of possible worlds. Therefore, a theory of meaning and context dependent interpretation of English must, if it is to handle such examples successfully, adopt a representation of contexts that goes beyond what sets of possible worlds are able to reveal. (Kamp 1988:158).

P. I see. So, as a result of these observations about anaphora, possible worlds don't have the audience that they once enjoyed and semantics and pragmatics are not going to find a suitable meeting place here.

S. Not really, to both observations, although there is large amount of introductory and survey literature appearing at the moment – for example, Divers (2002); Girle (2003) and Melia (2003) – that might stimulate a renewed interest. Discourse representations are, at the moment, one of the preferred currencies.

P. So, possible worlds are waning. They *did* come with a lot of baggage, I suppose, rather too much intensionality.

S. Yes, Davidson spoke about this early on:

> There is . . . a danger that the know-nothings and the experts will join forces: the former, hearing mutterings of possible worlds, transworld lines, counterparts, and the like, are apt to think, *now* semantics is getting somewhere – out of this world, anyway. (Davidson 1973:78).

P. It's funny that you should mention Davidson.

S. Why's that?

P. Well, I understand that, just as possible worlds have been waning, Davidsonian Semantics has been waxing, or maybe, re-waxing, if there is such a word.

S. Yes, that seems to be at least partly the case. I think you must be thinking of such recent publications as Borg (2004) and Cappelen & Lepore (2005).

P. Yes, I think so. And Lepore & Ludwig (2005).

S. I haven't read all of these properly yet so I'm not really in the best position to discuss them just yet. Perhaps if we do this again at some time in the future, perhaps we could do it then.

P. OK.

S. But, judging from Borg's and Cappelen and Lepore's titles, at least, the Davidsonian Program still endorses a very small semantics, and leaves many things that cannot be brought into extensional truth conditions to pragmatics.

P. So, on the surface at least, this Program is maybe conceptually and strategically compatible with Grice's.

S. Yes, on the surface at the least, and maybe not just on the surface. We'll return to it.

P. OK.

S. Erm, just to go back a bit, to something you said earlier.

P. Yes.

S. You said that the notion of conventional meaning in Grice's work is almost completely undefined.

P. Well, that was a bit of a rhetorical flourish. Grice (1989:87–88) has a number of suggestions to make on this matter, but he is careful to say that he is merely providing 'a sketch of direction, rather than a formulation of a thesis' and he adds that the formulation he comes up with contains a 'hideous simplification' (Grice 1989:87).

S. So the notion is not 'almost completely undefined'?

P. No. But take a look at what he says:

> I want to say that (1) "U (utterer) said that p" entails (2) "U did something x by which U meant that p." But . . . many things are examples of the condition specified in statement (2) which are not cases of saying. For example, a man in a car, by refraining from turning on his lights, means that I should go first, and he will wait for me.
>
> Let us try substituting, for (2), (2'):

> "U did something x (1) by which U meant that p
> (2) which is of a type which means 'p'." (that is, has for some person or other an established standard or conventional meaning). (Grice 1989:87)

He goes on to say: 'There is a convenient laxity of formulation here' (Grice 1989:87). And his next attempt, running to five clauses, is the one that contains a 'hideous oversimplification'. Perhaps I will be forgiven if I don't repeat it here.

S. Oh, I think I would like to see it.

P. Now, why's that exactly?

S. Well, I think I might have a useful observation to make, a little later.

P. OK, then. Grice says:

> We want doing x to be a linguistic act; with hideous oversimplification we might try the formulation:
>
> "U did something x (1) by which U meant that p
> (2) which is an occurrence of an utterance type S (sentence) such that
> (3) S means 'p'
> (4) S consists of a sequence of elements (such as words) ordered in a way licensed by a system of rules (syntactical rules)
> (5) S means 'p' in virtue of the particular meanings of the elements of S, their order, and their syntactical character. (Grice 1989:87).

He goes on:

> I abbreviate this to:
>
> "U did something x (1) by which U meant that p
> (2) which is an occurrence of a type S which means 'p' in some linguistic system"
>
> This is still too wide. U's doing x might be his uttering the sentence "She was poor but she was honest." What U meant, and what the sentence means, will both contain something contributed by the word "but", and I do not want this contribution to appear in an account of what (in my favoured sense) U said (but rather as a conventional implicature). (Grice 1989:87–88).

There. That's it. You can probably see why I didn't want to go there.

S. Yes. Thanks.

P. You're very welcome.

S. But what Grice outlines here as an analysis of what is said, in his favoured sense, is a long way from the direction that subsequent inquiry took.

P. There is a problem, yes. Levinson says:

> Grice uses the phrase *what is said* as a technical term for the truth-conditional content of an expression, which may in fact be somewhat less than the full conventional content. (Levinson 1983:97, fn1).

Levinson squirrels this remark away in a footnote but it is reasonably clear that Grice had something else entirely in mind about this.

S. And the analysis of 'what is said' is something of an expanding market at the moment. Perhaps I might employ the conversational equivalent of a footnote and just list, in alphabetical order, some of the main contributions: Bach (2001); Hawley (2002); Recanati (1989, 2001, 2004c); Saul (2002a,b); and Ziff (1972).

P. Sure.

S. OK. Let's leave conventional meaning and move onto conventional implicature. This is another way that our language can have meaning, isn't it? Grice doesn't say too much about this kind of meaning.

P. He says that 'the nature of conventional implicature needs to be examined before any free use of it, for explanatory purposes, can be indulged in' (Grice 1989:46), though he doesn't do that examination himself, no.

S. That's my impression.

P. But he does say that a difference between a conversational and a conventional implicature is that the former must be capable of 'being worked out', and that 'it is all too easy to treat a generalized conversational implicature as if it were a conventional implicature' (Grice 1989:37).

S. OK. So where are we with conventional implicature. The classification looks unhelpful.

P. Enter Horn:

> . . . conventional implicature remains a controversial domain. While it continues to be invoked to handle non-truth-conditional aspects of lexical meaning, this tends to constitute an admission of analytic failure, a label rather than true explanation of the phenomenon in question. It has on occasion been maintained that conventional implicature is a myth (Bach 1999), and even for the true believers, the domain in which such implicatures have been posited continues to shrink, eaten away on one side by an increasingly fine-grained understanding of truth-conditional meaning and entailment . . . and on the other by a more sophisticated employment of the tools of conversational implicature. While conventional implicature remains a plausible *faute de mieux* account of particles like *even* and *too*, whose contribution has not convincingly been shown to affect the truth conditions of a given utterance but is not derivable from general considerations of rationality or cooperation, the role played by conventional implicature within the general theory of meaning is increasingly shaky. (Horn 2004:6).

S. Increasingly shaky, eh?

P. Well, no. Or rather, not necessarily.

S. Why's that?

P. Some stability has been brought into the picture by Potts (2005). He presents a bold reanalysis of conventional implicatures that models them with a type-driven multi-dimensional semantic translation language, working out the classical idea of Karttunen & Peters (1979) on a three dimensional semantics.

S. Semantic?

P. Yes. His first sentence in Chapter 1 is: 'I hope readers of this book are struck by how little pragmatics it contains'.

S. But conventional implicatures as semantic? How does he get to that claim?

P. He takes some quotes from Grice. He takes this one:

> In some cases the conventional meaning of the words used will determine what is implicated, besides determining what is said. (Grice 1989:25).

Of this, he says:

> The phrase 'the conventional meaning of the words' is the crux of this statement, since it locates CIs [this is a Potts-abbreviation for conventional implicatures] in the grammar. The 'conventional' part of 'conventional implicature' stands for 'not calculable from the conversational maxims and the cooperative principle'. This is initial (and compelling) motivation for a dividing line between the phenomena that pragmatic principles should cover (conversational implicatures) and those that they cannot (CIs, among others). (Potts 2005:9).

S. But wait a minute. Potts is here conflating conventional meaning and conventional implicature. Grice is talking about conventional meaning – and he gives some idea of what he hopes, eventually, to be understood by this term in those formulations that you outlined just a minute ago. I'm glad I asked you to elaborate further. (I know you were reluctant.) But Potts is here slipping from this onto conventional implicature and stating that they are in the grammar. This is not, surely, a safe step.

P. Well, he goes on to say that 'the 'implicature' part of 'conventional implicature' is unfortunate' (Potts 2005:9). I'm not so inclined to agree with him on this. It has always seemed to me, and, I suspect, to others, that 'implicature' refers to those inferences that *are* cancellable, and conventional implicatures are cancellable. Take a well-worn example (in fact, it's already been used here): 'She is poor but honest and I don't mean to suggest that there is anything surprising in that conjunction'.

S. Is it possible to say that?

P. I think so, yes. Anyway, on the basis of the above quote and a few others, Potts extracts the following abstract properties of conventional implicatures:

a. CIs are part of the conventional meaning of words.

b. CIs are commitments, and thus give rise to entailments.

c. These commitments are made by *the speaker of the utterance* 'by virtue of the meaning of' the words he chooses.

d. CIs are logically and compositionally independent of what is '*said* (in the favored sense)', i.e. independent of the at-issue entailments. (Potts 2005:11).

Where 'at-issue entailments' is Potts-speak for 'regular asserted content ('what is said', in Grice's terms)' (Potts 2005:6).

S. Hmmm. So there is quite a large number of changes being introduced.

P. Yes. And it goes a little further. The empirical focus also changes:

> Suppose the textbook examples (*therefore*, *even*, *but* and its synonyms) disappeared. Where would conventional implicatures be then? This book's primary descriptive claim is that they would still enjoy widespread factual support. (Potts 2005:5).

S. So what's the empirical focus now?

P. On the one hand, supplemental expressions like appositives and parentheticals and, on the other hand, expressives like epithets and honorifics.

S. Interesting data.

P. Yes.

S. But let's cut to the chase: does, on this data, the type-driven multi-dimensional semantic translation language bring some stability to the increasingly shaky role played by conventional implicature within the general theory of meaning?

P. Well, that rather depends on what you mean by 'the general theory of meaning'

S. Or, by what you take to be the locus of where semantics meets pragmatics.

P. Yes. Potts provides a 'meaning graph' (Potts 2005:23). It goes a bit like this. 'Meanings' are taken to be 'entailments' or 'context dependent'. 'Entailments' are taken to be (a) 'conventional presuppositions' (not speaker oriented, backgrounded); (b) CIs; and (c) 'at issue entailments' (not invariably speaker oriented, vary under holes, plugs). 'Context dependent meanings' are taken to be (a) 'conversational implicatures' (not conventional, not speaker oriented, not backgrounded) and (b) 'conversationally-triggered presuppositions' (not speaker oriented, backgrounded).

S. Holes and plugs?

P. Yes, I'm not entirely convinced that conventional implicatures and presuppositions are being kept separate here.

S. That is all quite dense. I'll not request that you repeat it for me, though. But what's the difference between the conversationally-triggered and the conventional presuppositions, both of which are said to be not speaker oriented and backgrounded?

P. Well, presumably the first is, whilst the second isn't, cancellable.

S. Of course.

P. But that's not the most pressing concern.

S. Oh?

P. I'm more worried about what he says here:

> . . . it is worth noting that Levinson (2000) proposes to distinguish generalized and particularized conversational implicatures from one another, in service of the more general goal of developing a robust notion of *default interpretation*. I do not explore this hypothesis, mainly because it seems clear that this is an issue that impacts the nature of the 'context-dependent' node in [the meaning graph] and the paths from it. (Potts 2005:25).

I would have thought, given Grice's previous remark about the difficulty of distinguishing generalized conversational implicatures from conventional implicatures, that Levinson's TGCI would have merited the closest scrutiny.

S. Well, as I said earlier, there is quite a large number of changes being introduced here.

P. Yes, and to answer your question about stabilizing the shakes – I think it is too early to tell. I'm still inclined to think that conventional implicatures *are* pragmatic and that a logic of them, whether type-driven, or multi-dimensional, or whatever, will have to contain a large defeasible character. But perhaps my thinking is just a bit slow at moving with the times.

S. Well, perhaps this is the moment to bring this dialogue to a close, and to make way for the main event.

P. Yes, I agree. The subject is, as Kneale remarked, full of perplexities, some of which we may not even have noticed, let alone addressed, but the papers to come in this collection will, I think, and I think you think too, show that there are many theoretically and descriptively profitable lines of inquiry that will help not only to demarcate but also to integrate meanings and uses.

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SEMANTICS – PRAGMATICS INTERFACE

THE BORDER WARS: A NEO-GRICEAN PERSPECTIVE

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Abstract

In reports filed from several fronts in the semantics/pragmatics border wars, I seek to bolster the loyalist (neo-)Gricean forces against various recent revisionist sorties, including (but not limited to) the relevance-theoretic view on which the maxims (or more specifically their sole surviving descendant, the principle of relevance) inform truth-conditional content through the determination of "explicatures", Levinson's defense of implicatures serving as input to logical form, recent arguments by Mira Ariel for a semantic treatment of the upper bound ('not all') for propositions of the form *Most F are G*, and Chierchia's proposal to reanalyze implicatures as part of compositional semantics. I argue for drawing the semantics/pragmatics boundary in a relatively traditional way, maintaining a constrained characterization of what is said, while adopting a variant of Kent Bach's position on "impliciture" and supporting the Gricean conception of implicature as an aspect of speaker meaning, as opposed to its reconstruction in terms of default inference or utterance interpretation. I survey current controversies concerning the meaning and acquisition of disjunction and other scalar operators, the relation of subcontrariety and its implications for lexicalization, the nature of polarity licensing, and the innateness controversy. In each case, I seek to emphasize the significance of the generalizations that a (neo-)classical pragmatic approach enables us to capture.

For some time, David Kaplan (cf. Kaplan 1978:223) has taken to harking nostalgically back to the Golden Age of Pure Semantics, which reached its apotheosis with the theory of extension and intension in Carnap's (1947) *Meaning and Necessity* before the tarnish from the ravages of proper names and demonstratives inevitably set in. Following Kaplan's lead, I will dub the traditional pre-lapsarian pragmatic theory, on which non-truth-conditional aspects of meaning are read off the output of semantically interpreted logical form, the Golden Age of Pure Pragmatics, a.k.a. GAPP (see e.g. Grice [1967] 1989, Horn 1972, 1973, Gazdar 1979, Levinson 1983, Hirschberg 1991).

My survey of the borderlands where semantics meets pragmatics begins with the relevance-theoretic (e.g. Sperber & Wilson, Carston) view on which the maxims (or more specifically their sole surviving descendant, the principle of relevance) inform truth-conditional content through the determination of "explicatures" and Levinson's framework on which implicatures serve as input to logical form.

1 Implicature, explicature, and propositional content

As is well known, GAPP advocates a general account of scalar values as lower-bounded by their literal meaning (what is said) and upper-bounded by quantity-based implicature. Thus the "one-sided" meanings delivered by the linguistic semantics is filled in to yield the "two-sided" communicated understandings in the examples in (1):

(1) GAPP on scalars	1-SIDED MEANINGS	→	2-SIDED UNDERSTANDINGS
a. Pat has **3** children.	'. . . at least 3 . . . '		'. . . exactly 3 . . . '
b. You ate **some** of the cake.	'. . . some if not all . . . '		'. . . some but not all . . . '
c. It's **possible** she'll win.	'. . . at least ♢ . . . '		'. . . ♢ but not certain . . . '
d. He's a knave **or** a fool.	'. . . and perhaps both'		'. . . but not both'
e. It's **warm**.	'. . . at least warm . . . '		'. . . but not hot'

The alternative view, on which each scalar predication in (1) is lexically ambiguous between one-sided and two-sided readings, is ruled out by the general metatheoretical consideration that Grice dubs the Modified Occam's Razor principle: "Senses are not to be multiplied beyond necessity." The same principle has been endorsed elsewhere ("Do not posit an ambiguity unless you are forced to, unless there are really compelling theoretical or intuitive grounds to suppose that an ambiguity really is present" – Kripke 1977:20).

Negating such predications denies the lower bound: to say that something is not possible is to say that it's less than possible. When it is the upper bound that appears to be negated (*It's not possible, it's CERTAIN*), a range of syntactic, semantic and intonational evidence indicates the presence of a METALINGUISTIC or echoic use of negation, in which the negative particle is used to object to any aspect of an alternate (actual or envisaged) utterance, including its conventional and conversational implicata, register, morphosyntactic form or pronunciation (Horn 1989:Chapter 6). If it's hot, it's (a fortiori) warm, but if I know it's hot, the assertion that it's warm can be echoed and rejected as (not false but) insufficiently informative, as in (2):

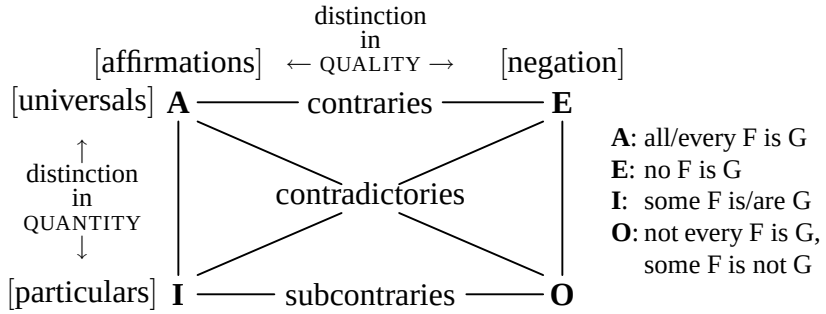
(2) It's not WARM, it's HOT!

(3) You're right, it's not warm. It's HOT!

As seen in (3), the metalinguistic understanding typically requires a second pass and the effect is typically that of an ironic "unsaying" or retroactive accommodation. (More recently, other approaches have been proposed for these cases, with Carston (1996) in particular recasting these marked uses as echoic negation applying to propositional content; see Horn 2002 for related discussion and references.)

One of the original motivations for GAPP was the straightforward and general account it offers of relations among the logical operators, particularly that between the two subcontraries situated at the **I** and **O** vertices of the traditional post-Aristotelian Square of Opposition in (4):

(4) SQUARE OF OPPOSITION



By GAPP, the assertion of either particular subcontrary implicates that (for all the speaker knows) the opposite subcontrary holds, or equivalently that the negation of the corresponding universal

holds: in asserting that *some* … I implicate (ceteris paribus) that for all I know *not all* … Binary connectives (as we shall see below), modal and deontic operators, and other proposition-embedding operators behave in similar fashion (see Horn 1972). More generally, the assertion of a weak scalar value implicates the negation of stronger values in the same domain.

Coming to these issues from the direction of relevance theory (RT), Sperber & Wilson (1986), Carston (2002), and others have rejected GAPP, taking the bilateral understanding of scalar predications to represent an EXPLICATURE, a pragmatically determined component of what is said rather than part of what is (merely) implicated. On such an approach, both one-sided and two-sided understandings of sentences in (1) are directly represented at the level of logical content. While such scalar predications are now all taken to be ambiguous, the ambiguity has been relocated to the propositional level: what is **said** in an utterance is systematically underdetermined by the linguistic content of what is **uttered**. In particular, the RT approach convincingly overturns the original Gricean line on the meaning of cardinal operators (lower-bounded by meaning, upper-bounded by implicature).

However, while a strong case can be made for an enrichment analysis of the meaning contribution of the cardinals, it does not generalize straightforwardly to the "inexact" scalar values. Evidence for this conclusion (summarized in Horn 1992) comes from the contextual reversibility of cardinal scales and the non-implicating ('exactly n') reading of cardinals in mathematical, collective, and elliptical contexts, none of which applies to the scalar operators in e.g. (1b–e). Note also the contrast in the exchanges in (5):

(5) A: Do you have two children?
B_1: No, three.
B_2: ?Yes, (in fact) three.

(5′) A: Did many of the guests leave?
B_1: #No, all of them.
B_2: Yes, (in fact) all of them.

and the fact that (6a) works only as game-playing, while (6b) is entirely natural:

(6) a. #Neither of us liked the movie – she adored it and I hated it.
b. Neither of us has three kids – she has two and I have four.

Similarly, if (1e) were in fact propositionally ambiguous, there is no obvious reason why a 'No' response to the question 'Is it warm?' should not be interpretable as a denial of the enriched, two-sided content and thus as asserting that it's either chilly or hot, or why the comparative in "It's getting warmer" cannot denote 'less hot' instead of 'less cold.'

These observations suggest the need for a mixed approach on which cardinal values demand an enriched-content analysis while other scalar predications continue to submit to a standard neo-Gricean treatment on which they are lower-bounded by their literal content and upper-bounded, in default contexts, by implicature. The same distinction surfaces as significant in early childhood, according to recent work in developmental psycholinguistics (Papafragou & Musolino 2003).

Both GAPP and its RT critics have tacitly assumed that whatever is communicated but not said must be implicated. Some (e.g. Levinson 2000) have argued from this assumption to the conclusion that implicatures can affect ("intrude on") truth-conditional meaning after all; others have argued instead for the notion of explicature, i.e. pragmatically determined content. But as Kent Bach has stressed, some aspects of speaker meaning are neither part of what is implicated nor of what is said. Thus consider (7a-e) as uttered in contexts in which the material indicated in curly brackets is conveyed.

(7) a. I haven't had breakfast {today}.
b. John and Mary are married {to each other}.
c. They had a baby and they got married {in that order}.
d. Robin ate the shrimp and {as a result} got food poisoning.
e. Everybody {in our pragmatics class} solved the riddle.

In each case, the bracketed material contributing to the overall communicated meaning cannot (pace Levinson 2000) arise by Gricean implicature, given that it affects truth conditions, but neither can it be part of what is said, since it is felicitously cancellable:

(8) a. John and Mary are married, but not to each other.
b. They had a child and got married, but not necessarily in that order.

Those enrichments that constitute necessary conditions for the expression of truth-evaluable propositions involve what Recanati has called saturation. In such cases, there is a "bottom-up" process triggered by such linguistic elements as genitives (*John's car* – the one he owns? is driving? is following? is painting? is repairing?), unspecified comparison sets (*Chris is tall* – for an adult (fe)male? for an adult American of the relevant sex?) or other expressions with free variable slots: *Lee is ready* (for what?), *Robin is too short* (for what?). Once again it appears that pragmatic inference (but not implicature!) may be responsible for the computation of truth-conditionally relevant propositions that are not directly expressed. But such propositions are not "explicatures" because they are not explicit; and, as Cappelen (2000) stresses, they are crucially cancellable or defeasible and thus cannot constitute what is said. Following Bach (1994, 2001) we can regard these enrichments as IMPLICITURES until a better term comes along.

This approach permits us to account for so-called pragmatic intrusion while maintaining the classic retro-GAPP-style SYNTACTIC CORRELATION CONSTRAINT (Bach 2001, after Grice 1989:87): what is said must correspond to "the elements of [the sentence], their order, and their syntactic character"; aspects of enriched content that are not directly linked to the utterance cannot be part of what is said.

Similarly, Taylor (2001) has stressed the role of beliefs about the world to explain why enrichment proceeds differently in (9a) than in (9b),

(9) a. I haven't had breakfast.
b. I haven't had sex.

although this would change in a culture in which one normally has sex (but not breakfast) each morning. Saul (2002) has argued persuasively that the (neo-)Gricean and relevance-theoretic conceptions of meaning are not as incompatible as it may appear, given Grice's concerns for an account of speaker meaning (of which implicature constitutes a proper subpart) and relevance theorists' goal of attaining a cognitive psychological model of utterance interpretation, which does not address the question of how and why the speaker, given what she wants to convey, utters what she utters. While there is a natural tendency to characterize Grice's project in terms of the interpretation of utterances (whence Levinson's 2000 characterization of generalized conversational implicatures as default inferences), it must be resisted, as Bach and Saul have argued.

If scalar predicates represent an ongoing skirmish in the border wars, the analysis of asymmetric conjunction is a major battleground. The logical connective is of course a symmetric truth function; "p & q" is true if p and q are both true and false otherwise – and hence so is "q & p". Strawson (1952:80) pointed to the apparent contrast in meaning exhibited by pairs like (10a,b)

(10) a. They got married and (they) had a child.
b. They had a child and (they) got married.
c. They got married and then (they) had a child.

as prima facie counterexamples to this thesis, since the former appears to amount to the statement in (10c). (The parenthetical pronoun is inserted to make these sentences look more like the logical conjunctions to which they correspond, although that renders the asymmetric understanding less inevitable.) Similarly, Ryle (1954) famously observed that to get on one's horse and ride away is not the same as to ride away and get on one's horse.[1] For Urmson (1956:9–10), however, the truth-functional picture, while incomplete, is not therefore incorrect:

> In formal logic, the connectives "and" and "or" are always given a minimum meaning, as we have done above, such that any complex formed by the use of them alone is a truth-function of its constituents. In ordinary discourse the connectives often have a richer meaning; thus 'he took off his clothes and went to bed' implies temporal succession and has a different meaning from 'he went to bed and took off his clothes.' Logicians would justify their use of the minimum meaning by pointing out that it is the common element in all our uses of "and."

On the classical pragmatic approach, an assertion of the conjunction in (10a) implicates (10c) by virtue of the "Be orderly" submaxim of Manner (Grice 1981:186). Indeed, Grice's approach was prefigured in the observation that "Events earlier in time are mentioned earlier in the order of words than those which occurred later", one of the eight "natural principles" that influence word order in the inventory of Dionysius of Halicarnassus, *Peri syntheseos onomaton (On the Juxtaposition of Words)* in the 1st cent. B.C., cited in de Jonge (2001).

On this Dionysian/Gricean line, the distinction in meaning between (10a,b) need not be laid at the doorstep of an ambiguous *and* operator. For those who would semanticize temporal asymmetry, such a lexical ambiguity must be invoked for the fact that a non-sequential interpretation is available not only for non-eventive sentences *(They are tall and they are rich)* but even for

[1]The notoriety of Ryle's observation is indicated by its reappearance, mutatis mutandis, in a letter to the editor of the New York Times (July 20, 1988, A26) 34 years later:

> To the Editor:
>
> Six distinguished writers and philosophers – A. J. Ayer, Graham Greene, H. L. A. Hart, John Le Carre, John Mortimer, P. F. Strawson – writing on the West Bank and Gaza, call "for an end to Israeli occupation and the convening of an international peace conference for all parties concerned" (letter, July 8). But what is to be settled by such a conference? What will Israel have left to negotiate about if it first withdraws and then negotiates? Another distinguished British philosopher, Gilbert Ryle, once observed that it makes sense to say, "She took poison and died," but not, "She died and took poison." A simple point of logic seems to have escaped six eminent thinkers.
>
> – Raziel Abelson (Professor of Philosophy, N.Y.U.)

(10a) in the appropriate context, as in a reply to the question "Did they experience any unusual sources of stress last year?" Arguments against a lexical ambiguity for *and* (= 'and also' vs. 'and then') include the following:[2]

(11) a. On the ambiguist (two-*and*) theory, conjunction in (almost?) every language would just happen to be ambiguous in the same way.

b. No natural language contains a conjunction *shmand* ambiguous between 'and also' and 'and earlier' readings, so that *They had a baby shmand they got married* would be interpretable either atemporally or as 'They had a baby and, before that, they got married'.

c. Not only temporal but causal asymmetry would need to be built in, as a variety of apparent strengthenings of the conjunction arise in different contexts of utterance.

d. The same "ambiguity" exhibited by *and* arises when two clauses describing related events are juxtaposed without an overt connective *(They had a child. They got married.)*

However, if conjunctions are semantically univocal while Manner-implicating that the events occurred in the order in which they were described, the impossibility of the conjunction *shmand* can be attributed to the absence of any maxim enjoining the speaker to "Be disorderly." As with scalar implicature, the asymmetric implicatum may be cancelled or suspended: *They had a child and got married, but not necessarily in that order*. But if the 'and then' reading comes in only as an implicature, it is hard to explain its apparent contribution to truth-conditional meaning in embedded contexts, and in particular the non-contradictory nature of (12a-c) as pointed out by Cohen (1971) and Wilson (1975):

(12) a. If they got married and had a child, their parents will be pleased, but if they had a child and got married their parents will not be pleased.

b. They didn't get married and have a child; they had a child and got married.

c. It's more traditional to get married and have a child than to have a child and get married.

One possible conclusion is that while pragmatically derived, the strengthened or enriched meaning is an explicature, corresponding to what is said rather than to what is (merely) implicated[3] (see Carston 2002 and works cited therein); another is that we must revisit the architecture of Gricean theory to allow implicature to help determine propositional content (Levinson 2000:Chapter 3).

The same options arise for the scalar-antecedent conditionals in (13), in which both Levinson and explicature theorists would build the stronger (bilateral) meaning (e.g. *some but not all, warm but not very warm*) into what is said.

(13) a. If some of my friends come to the party, I'll be happy – but if all of them do, I'll be in trouble.

[2]See Posner (1978) for a compilation of such arguments.

[3]While (12b) may be attributed to metalinguistic negation (Horn 1989:373), this analysis is unavailable for (12a) or (12c). For a GAPP-compatible approach to (12a)-style conditionals, see Horn (2004:22).

b. If it's warm, we'll lie out in the sun. But if it's {VERY warm/hot}, we'll go inside and sit in front of the air-conditioner.

c. If you're convicted of a felony, you'll spend at least a year in jail. And if you're convicted of murder, you'll be executed.

d. If you're injured, the paramedics will take you to the nearest trauma center. But if you're fatally injured, you'll be taken to the morgue.

But in each of these contexts, it's only when the stronger scalar is reached that the earlier, weaker one is retroactively adjusted to accommodate an upper bound into its semantics, e.g. with *some* being REinterpreted as expressing (rather than merely communicating) 'some but not all.' This reinterpretation is facilitated by the obligatory focus on the relevant scalar operators.

The same issues arise for other applications of the pragmatic intrusion argument. Thus, Levinson (2000:210) extends the classic Cohen-Wilson argument from conditionals like (12a) to *because* clauses, based on examples like those in (14):

(14) a. Because he earns $40,000, he can't afford a house in Palo Alto.

b. Because he's such a fine friend, I've struck him off my list.

c. Because the police recovered some of the missing gold, they will later recover it all.

But these examples are heterogeneous. (14a) involves a cardinal, which as noted above is indeed plausibly taken to involve an adjustment of what is said. In (14b), on the other hand, *such a fine friend* involves conventionalization of the sarcastic meaning; compare *?Because he's so considerate, I fired him*. The *all* in the second clause of (14c) forces the reprocessing of the some in the first clause as 'some but not all' (a reprocessing again triggered by the focal stress on *some*). Without the *all* or some other context-forcing continuation, this narrowing appears to be impossible:

(15) Because the police recovered some of the gold, the thieves are expected to return later #(for the rest).

In general, such *because* cases are quite constrained, in particular for the non-cardinal scalar cases in which the implicated upper bound is taken to be the reason for the truth of the second clause (as in (15)) and in which no reprocessing is forced by the affirmation of a stronger value (as in (14c)). Thus consider:

(16) a. #Because it's warm out [i.e. because it's warm but not hot], you should still wear a long-sleeved shirt.

b. #Because you ate some of your stewed eel [i.e. and not all], you don't get dessert.

Let us summarize the situation on the borderlands to this point. For a GAPP theorist, implicatures, by definition, cannot serve as input to propositional content/what is said. Generalized conversational implicatures are not default inferences; they are by definition an aspect of speaker's meaning, not hearer's interpretation (cf. Geurts 1998:fn. 12, Schwenter 1999:26, Bach 2001, and especially Saul 2002). The Gricean approach to what is said (although incomplete at the edges, where Bach's approach may be especially fruitful), continues to offer a robust research strategy for the investigation of linguistic communication.[4]

[4]One interesting result from recent work on acquisition by Papafragou, Musolino, Noveck and others (cf. Noveck 2001, Papafragou & Musolino 2003) is that children may be more adept than adult speakers at distinguishing the contributions to overall speaker meaning contributed by what is said vs. what is implicated.

2 Implicature, polarity licensing, and compositionality

We now turn to recent work by Gennaro Chierchia that re-examines the projection properties and status of scalar implicatures. In earlier work on this problem, Gazdar (1979) argued that scalar implicatures (henceforth SIs) are blocked in embedded contexts, based on the observation that a standard upper-bounding implicature like that from (the assertion of) (17a) to (17a') seems to disappear when the scalar predicate falls within the scope of a logical operator as it does in (17b), which does not implicate (17b').

(17) a. Paul ate some of the eggs.
a'. [For all the speaker knows] Paul did not eat all of the eggs.
b. It is not the case that Paul ate some of the eggs.
b'. [For all the speaker knows] It is not the case that Paul did not eat all of the eggs. [= He ate all of them.]

But as detailed by (Hirschberg [1985] 1991), this cannot be a fact about embedded environments in general, since substituting e.g. "It is obviously the case that" for "It is not the case that" in (17b/b') will restore the implicature. On Hirschberg's account, SIs are blocked by overt negation alone. But while Gazdar's approach blocks too many implicatures, Hirschberg's blocks too few. Without fully making the case for the conclusion, I suggested (Horn 1989:233–34) that SIs are blocked in downward entailing (DE) contexts. But, as Levinson (2000:254–55) observes, it is not really a question of blocking the implicatures generated by the positive scale, but predicting the implicatures induced by the inverse scale, given the scale-reversing properties of negation and other downward entailing operators (Fauconnier 1975):

> According to Horn, Gazdar, and Hirschberg, scalar implicatures are simply blocked (i.e., do not arise) under negation. This is an erroneous assumption based on the correct observation that the *same* implicatures are not shared by positive and negative counterparts of the same senence (utterance-type). . . . [T]he apparent blockage is due to the fact that negatives reverse scales (because negation effects [sic] the strength of scalar items) and so we get different implicatures, which themselves survive negation . . .

Thus, when I assert that Paul didn't eat many of the eggs, I implicate (ceteris paribus) not that he didn't eat all of them (since the positive scale <all, most, many, some> will not be relevant here), but that he didn't eat none of them, i.e. that he ate some (since the scale <no(ne), not many, not all> is now operative).

This is where Chierchia (2004) comes in. Based on the interaction of negation and disjunction in complex sentences, Chierchia argues that SIs must be computed compositionally rather than read off utterances "globally" and they are hence part of the grammar, with semantic rather than "merely" pragmatic effects: "Some aspects of the pragmatic system are more grammar-like than we thought" (see also the subtitle to Chierchia et al. 2001). Further, the correlation of NPI licensing and SI suspension in DE contexts should be directly predicted and accounted for in terms of the parallel strengthening effect yielded by negative polarity items (NPIs) and SIs.

It should be noted first that even if the case can be made for local and compositional computation of SIs along the lines of Chierchia's account, the issues of compositionality and grammatical/semantic status are distinct. Since Karttunen & Peters (1979), it has typically been assumed

that we need to allow for a compositional projection of CONVENTIONAL implicature or presupposition, although on this account and many others such conventional implicatures are not part of what is said, nor do they affect truth-conditional meaning, although on some definitions they do count as semantic. Gazdar (1979) provides an alternative account of a compositional projection of im-plicatures (potential scalar or clausal implicatures) and pre-suppositions (potential pragmatic presuppositions); his compositional theory, like that of Karttunen & Peters, is consistent with a GAPP-style approach to the semantics/pragmatics distinction. While it may be true, as Geurts (1998) has argued, that there are significant differences between the projection properties of presuppositions and conversational implicatures, it is not obvious that these differences require us to take the latter to be more grammaticalized than the former. (See also Sauerland 2004 for a neo-Gricean treatment of some of the same projection facts considered by Chierchia, and see Blutner 2004 for additional challenges to a compositional view of pragmatically contributed meaning.)

As far as the issue of implicature blockage vs. reversal is concerned, Chierchia distinguishes the behavior of positive scales inducing "direct" SIs from that of negative and DE contexts in which, he maintains, only "indirect" SIs are possible; the latter sort of implicatures "appear to be generally somewhat weaker and flimsier than their positive counterparts" (2004). The standard GAPP account makes no such differentiation. Just as the assertion of (18a) will (ceteris paribus) implicate (19a), resulting in the communication of (18b), the assertion of (19a) will (ceteris paribus) implicate (18a), resulting in the communication of (19b). This parallel is generated by the twin determiner scales in (18c) and (19c).

(18) a. Some F are G.
b. Some Fs are Gs, but not all are.
c. <all, most, many, some>

(19) a. Not all F are G.
b. Not all F are G, but some are.
c. <none, few (not many), no(ne)>

Is there any evidence that the implicature in the positive case is more direct or stronger than in the negative, or that the scalar effects in (18) are more robust than those in (19)? Ironically, the very first invocation of the term SCALAR IMPLICATURE in the literature (according to the *Oxford English Dictionary*) was that given in Horn 1972:96) to account for the fact that "*not all* implicates *not none*, i.e. *some*."

Chierchia comments on the relation between (20a) and (20b)

(20) a. I don't have many matches left.
b. I have some matches left.

that "Our intuitions concerning the implicature of sentences like [(20a)] are somewhat shaky. In particular, such a sentence may or may not implicate that I have some matches left" (Chierchia 2004). This is again "indirect" implicature.

Of course, the "may or may not" is endemic to implicature calculation, given the nature of cancelability and indeterminacy. The key point is the intuition that the implicatures in (19) and (20) are weaker, less direct than that in (18).[5] But how solid is this intuition? To evaluate this claim, we can look at one of the earliest applications of Gricean reasoning to natural language

[5]The same point is made in Chierchia et al. (2001:160), where it observed that while *John saw many students* will normally implicate that he didn't see all of them, no such implicature arises in e.g. *There aren't many students.* From

in the linguistic literature. Chomsky (1972:112) in fact regards the inference from *not many* to *some* in contexts like (20) or (21) as stronger, not weaker, than a garden-variety conversational implicature.

(21) a. Not many arrows hit the target.
b. Some arrows hit the target.

For Chomsky, "Sentence [(21a)] (equivalently, *Few arrows hit the target*) presupposes that some arrows hit the target." Similarly, (22a) is taken to presuppose (22b)

(22) a. {Not much/Little} enthusiasm was shown for that project.
b. At least some enthusiasm was shown.

He explicitly contrasts these cases with the positive scalar predication in (23),

(23) Two of my five children are in elementary school.

where "one is entitled to assume that three of my children are not in elementary school, perhaps by virtue of general conditions on discourse of a sort that have been discussed by Paul Grice in his work on 'conversational implicature'." But this assumption in (23) may be withdrawn *("... and so are the other three")*, while the "presuppositions" in (21a) and (22a) cannot be withdrawn.

I have argued (Horn 1972:Chapter 2), contra Chomsky, that the relation in (21) and (22) must be (scalar) implicature, not presupposition.[6] But even so, there does not seem to be any reason to believe that the inference with these pairs is on shakier or flimsier ground than that with (23) or other positive scalars. Without the posited asymmetry between positive and negative scales, we can't really claim that SIs are suspended in DE contexts, but only that (as Levinson points out) the SIs induced there are based on negative scales as in (19c) as opposed to positive scales as in (18c).

Given DE operators' dual role as licensers of NPIs and "blockers" of SIs, Chierchia seeks to unify the two phenomena under the umbrella of compositional semantics. In particular, he argues, just as NPIs serve to strengthen a negative implicature (as in the widening-cum-strengthening account of *any* due to Kadmon & Landman 1993), so too "implicatures must lead to strengthening" (Chierchia 2004).

But DO scalar implicatures result in strengthening? Let us return to the examples in (18) and (19). *Some but not all Fs are Gs* is more informative and more specific than *Some F are G* sans implicature, but it does not result in a stronger positive assertion, nor does *Not all F are G but*

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such observations follows the descriptive generalization

(i) Scalar implicatures do not arise in downward entailing environments.

But in fact *There aren't many students* DOES have an scalar implicature, viz. that there are some. Interestingly, it is noted in the same paper (Chierchia et al. 2001:162) that "DE operators reverse canonical entailments", but it is not recognized that it is for this very reason that they also reverse scales and SIs, rendering the descriptive generalization in (i) untenable.

[6]Even *few* only implicates *not none = some*. A report in the Boston Globe (on-line edition, 14 Oct. 2003) notes of knuckleball pitchers that "few, and perhaps none" had ever done what Tim Wakefield of the Red Sox did in starting and winning a post-season game. (`http://www.boston.com/sports/baseball/redsox/articles/2003/10/14/he_puts_own_spin_on_series/`)

some are result in a stronger (negative) claim than *Not all F are G*. By implicating the upper bound, the speaker in effect weakens the positive or negative force of what is said.

In the dualistic model of implicature I have been urging over the last two decades (Horn 1984, 1989, 1993), I distinguish Q-based implicatures, based on the Q Principle ("Say enough", a generalization of Grice's first maxim of Quantity), from R-based implicatures, based on the R Principle ("Don't say too much", subsuming the second Quantity maxim, Relation, and Brevity). While Q-based implicatures do not strengthen the force of an assertion, R-based implicatures in general do. These include the ascription of the ability to perform some action implicating the successful performance of that action, the "perfection" of a sufficient condition to a necessary and sufficient one, the narrowing of a word's extension from a set to a salient or prototype member or subset, the strengthening of negative statements from contradictory to contrary understandings, and more generally the use of vague expressions as euphemisms for what one would prefer to leave unsaid. In each case, as exemplified in (24)-(29), a speaker who utters the weaker version in (a) counts on the hearer to recognize that the stronger proposition in (b) was intended to be communicated (see Horn 1989:Chapter 5; Horn 2000b).[7]

(24) a. If you mow the lawn, I'll give you $5.
b. If and only if you mow the lawn, I'll give you $5. ["conditional perfection"]

(25) a. I don't believe that ϕ.
b. I believe that not-ϕ. ["neg-raising"]

(26) a. I don't like stewed eel. [contradictory negation]
b. I (actively) dislike stewed eel. [contrary negation, via litotes]

(27) a. . . . and this is my friend, Chris.
b. Chris is my "um-friend"/friend-plus. [strengthening via euphemism]

Unlike these cases in which the use of the weaker form implicates the more informative and stronger communicated meaning, in the scalar cases the gain in information yields a weaker (though more specific) assertion. The contrast is especially vivid in minimal pairs like that in (28), based on a strengthening R-based implicature, as opposed to (29), based on a non-strengthening Q-based (scalar) implicature.

(28) a. She was able to complete the assignment.
b. She completed the assignment.

(29) a. It is possible that she completed the assignment.
b. It is possible but not certain that she completed the assignment.

What of the claim that NPIs result in strengthening, as assumed in Chierchia's model? To be sure, ***any*** in both polarity and generic/non-episodic contexts (i.e. NPI and free choice *any*), as in (30),

[7]The (b) proposition in each of the examples in (24)-(27) is not implicated per se but rather communicated by incrementing what is said in (a) with what is R-implicated thereby.

(30) a. I don't have {potatoes/any potatoes}.
b. {An owl/Any owl} eats mice.

does involve strengthening of the corresponding simple indefinite in the sense of Kadmon & Landman (1993), or an end-of-scale 'even'-type meaning as others have argued for in related work (cf. Lee & Horn 1994, Lahiri 1998, Horn 2000a). Similarly, *ever* – the temporal analogue of *any* – and the class of MINIMIZERS exemplified in (31)

(31) a. Robin didn't {drink/touch} a drop of the punch.
b. Chris didn't sleep a wink last night.
c. Lee isn't saying a word about it.

serve to reinforce negation, thereby setting Jespersen's Cycle in motion (see Horn 1989 for discussion and references). However, other NPIs, and in particular those not involving indefinites, don't seem amenable to a strengthening analysis. In his valuable study of the lexical semantics of polarity, Israel (1996) distinguishes emphatic NPIs (including *any*, *ever*, *at all*, and the minimizers) from attenuating NPIs (e.g. *much*, *overmuch*, *long*, *be all that*, *any too*, *great shakes*, *be born yesterday*, *trouble to V*, *mince words*); the attenuators do not strengthen negative force. Prime examples of non-strengthening NPIs include negative modals (*need*, Du. *hoeven*), *yet*, *anymore* (for the relevant dialect), and *until*. We may plausibly regard *He won't ever recover* as a stronger negative than *He won't recover*, but there is no sense in which *She hasn't recovered yet* strengthens the negative force of *She hasn't recovered* or *He doesn't read much* strengthens that of *He doesn't read*.

To take another example, consider the effect of the boldface items in (32)

(32) a. There is*(n't) {**a shred of/an iota of**} evidence for that.
b. There is(n't) **a bit of** evidence for that.
c. There is(*n't) {**a little/a tad of**} evidence for that.

In each case, the addition of the highlighted material would weaken a positive assertion and strengthen a negative; yet the items in (32a) are NPIs, the items in (32c) are PPIs, and the item in (32b) is no polarity item at all. Once again, we see that the relation between strengthening and NPI-hood is anything but straightforward.

In light of the considerations we have reviewed, the proposed correlation between variation in NPI licensing (across languages or items within a language) and variation in the inducing or blocking of scalar implicatures remains unproven, if not unprovable. In addition to the problems outlined here, it is well known that not all polarity-licensing environments are downward entailing or scale-reversing (e.g. subjunctives, imperatives, generics, modals). Some triggers are subsumable under DE-hood by adjusting the definition (cf. Heim 1984, Krifka 1995), but not all. (See Linebarger 1987, Israel 1996, and Giannakidou 1998 for extensive discussion.) Given that 14th century logicians, without benefit of NPI alternations, developed a sophisticated theory of upward and downward entailment (cf. Sánchez Valencia 1994, Horn 1996) and that DE-ness appears to display robust early onset, as Stephen Crain and his colleagues have shown in studies of children's logical abilities, it is no surprise that downward entailment per se should turn out to be more strongly correlated with SI reversal than is polarity licensing.

And speaking of Crain . . .

3 Exclusivizing disjunction: Scalar implicature at thirty-something

In their contribution to a recent debate in the pages of *The Linguistic Review*, Crain & Pietroski (2002) construct a novel poverty of stimulus argument based on the behavior of disjunction and its acquisition by children. They begin from the observation that in non-DE contexts, *p or q* is assigned an inclusive "basic meaning" and gets an exclusive "derived" meaning via Gricean implicature. On the other hand, DE environments "licence NPIs and constrain the interpretation of disjunctive statements (to conjunctive readings)", i.e. with no upper bound. Thus (Crain & Pietroski 2002:170), (33a) implicates that he didn't talk to both a linguist and a philosopher last night, but no such "…but not both" implicature arises in the DE environments of (33b-d).

(33) a. He talked to a linguist or a philosopher last night.

b. He doesn't talk to linguists or philosophers.

c. He {never/rarely} talks to linguists or philosophers.

d. If a linguist or a philosopher goes to the gym, I go swimming.

Further, they argue, this distinction between contexts which do and do not license implicature is not something on which children have direct feedback; it is therefore plausible to hypothesize that this analysis of *p or q* is part of the innate linguistic mechanism.[8]

For Grice (1989:44), the relevant "strong sense" of *A or B* is actually not exclusive disjunction (i.e. the enrichment of the weak, one-sided logical disjunction by the Q-based upper-bounding implicatum) but rather the positing of a non-truth-functional reason for accepting A v B. In his classic example, someone who utters (34a) will normally implicate (34b),

(34) a. The prize is either in the garden or in the attic.

b. The speaker doesn't know for a fact that the prize is in the garden.

but this implicature may be cancelled either explicitly (e.g. by the continuation "…but I'm not going to tell you which") or contextually (e.g. by situating the assertion of (34a) as part of a treasure hunt).

Besides cancellability, Grice provides two additional arguments for a pragmatic account of the relation between (34a,b). One is the fact that the negation of (34a), *It is not the case that the prize is either in the garden or in the attic*, can only be interpreted as a denial of (34a) (i.e. as asserting that both garden and attic are devoid of prizes), not of (34b). The other is the Modified Occam's Razor we have already touched on in §1; indeed, it is in this context of disjunctive statements that Grice unveils the M.O.R.[9]

[8] If children "know" downward entailment, as Chierchia et al. (2001) argue, they will also know that *not (p or q)* is more, not less, informative than *not (p and q)*, so that in such environments no exclusivizing implicature will arise.

[9] While some have challenged the validity of the M.O.R. as a heuristic for linguistic semantics and pragmatics, Bontly (to appear) offers a spirited defense of the Occamo-Gricean principle by invoking the roles parsimony and implicature play in language acquisition, as demonstrated in Mazzocco's (1997) studies of homonymy avoidance in language acquisition. See also Doherty (2004) for additional studies bearing on children's resistance to homonymy.

A similar approach had been urged decades earlier by Ryle:

> I judge at Reading … 'That train is going either to Swindon or to Oxford'; and I do so without necessarily implying that the engine-driver, the passengers, or even I myself are in ignorance or doubt which its route actually is. Ordinarily, of course, I would not bother to *make* the statement if I was not in some doubt, since if I could identify its route it would be superfluous to mention such non-individuating facts about it. But facts do not cease to be facts or cease to be known when it becomes superfluous to mention them. (Ryle 1929:92–3).

The neo-Gricean derivation of exclusive disjunction, whereby an assertion of (35a) is upper-bounded by (35b), hence communicating (35c),

(35) a. Maggie is (either) patriotic or quixotic.
b. Maggie isn't (both) patriotic and quixotic.
c. Maggie is patriotic or quixotic but not both.

first appears in Horn (1972:98): "In normal contexts, all things being equal, existentials are upper-bounded by implicature, and disjunctions are exclusive by the corresponding implicature." Similar observations are made by Gazdar & Pullum (1976), Pelletier (1977), and Jennings (1994), but here again the basic idea goes back a bit further. John Stuart Mill, after assuming the proto-Gricean mantle in rejecting Hamilton's (1860) ambiguist analysis of *some* as 'some at least' vs. 'some only',

> No shadow of justification is shown … for adopting into logic a mere sous-entendu of common conversation in its most unprecise form. If I say to any one, "I saw some of your children today," he might be justified in inferring that I did not see them all, not because the words mean it, but because, if I had seen them all, it is most likely that I should have said so: even though this cannot be presumed unless it is presupposed that I must have known whether the children I saw were all or not. (Mill 1867:501)

extends the argument to disjunctions – "When we say A is either B or C we imply that it cannot be both." But this is no logical inference either: "If we assert that a man who has acted in a particular way must be either a knave or a fool, we by no means assert, or intend to assert, that he cannot be both" (Mill 1867:512). Earlier still, Archbishop Whately (1848:106) observes in relation to the two disjuncts in *Virtue tends to procure us **either** the esteem of mankind **or** the favour of God*:

> One being affirmed, we are not authorized to deny the other. We are left to **conjecture** in each case, **from the context**, whether it is to be **implied** that the members are or are not exclusive. [emphasis added]

It was Grice's contribution to allow for incorporating such observations in a general theory of cooperation and, more broadly, of rationality, emphasizing their non-purely linguistic character:

> As one of my avowed aims is to see talking as a special case or variety of **purposive**, **indeed rational behavior**, it may be worth noting that the specific expectations or presumptions connected with at least some of the . . . maxims have their analogues in the sphere of transactions that are not talk exchanges. (Grice 1989:28; emphasis added)

The role of rationality in pragmatics has been stressed by Kasher (1982:32), whose PRINCIPLE OF EFFECTIVE MEANS stipulates "Given a desired end, one is to choose that action which most effectively, and at least cost, attains that end, ceteris paribus." Kasher's principle incorporates the minimax give-and-take of effort and cost that also underlies models as diverse as the apparently unitarian relevance theory of Sperber & Wilson (1986), the dualistic Q- and R-based approach of Horn (1984), and the trinitarian Q/I/M heuristic of Levinson (2000).

In particular, the speaker's and hearer's joint (though tacit) recognition of the rational tendency to avoid unnecessary effort, and the inferences S expects H to draw from S's efficient observance of this tendency, are more explicable directly from rationality than from cooperation as such. While Grice (1989:28) describes how the maxims apply to cooperative ventures outside of language (baking a cake, fixing a car), collaboration need not be present, much less communication, at least for the quantity maxims. It seems plausible to assume that the generalized forms of both Q and R Principles – "Do enough; Don't do too much" – govern ANY goal-oriented activity: a person brushing her teeth, a dog digging a hole to bury a bone. In this way, the maxim of quantity, in both its opposed (Q and R) subforms, is a linguistic instantiation of these rationality-based constraints on the expenditure of effort. Of course, as Grice recognized, the shared tacit awareness of such principles to generate conversational implicatures is a central property of speaker meaning within the communicative enterprise. But if this is right, the fundamental nature of Q-based upper-bounding implicature, as in the exclusivizing of inclusive disjunction, while deriving from general and universal principles, is not – contra Crain & Pietroski (2002) – plausibly attributable to a linguistically specific innate mechanism.

4 Semanticization and the upper-bound: the case of *most*

Our next foray takes us to the ongoing skirmishes over the nature of *most*. Consider the relation between the assertion of (36a) and the corresponding upper bound in (36b).

(36) a. Most Israelis decided for peace.

b. Not all Israelis decided for peace.

On the standard GAPP analysis, based on the scale in (18c), repeated here as (37),

(37) <all, most, many, some>

this is of course standard upper-bounding implicature; what is said in (36a) is that (at least one) more than half of the relevant Israelis decided for peace, what is implicated is (36b), that not all of them did.

This minimizing analysis, in which bilaterality is pragmatically acquired, can be opposed to a semantic maximizing treatment on which (36a) (sometimes?) entails (36b). Any such account must allow for an ambiguity in *most* parallel to that detected for *some* by Hamilton (see §3

above). Peterson (1979) in fact finds an ambiguity in *most*, but it is one involving not the upper bound but the strength of *most*, and the primary sense is not the simple majoritarian one on which most Fs are G just in case more than half of them are, but a "few-not" *most* requiring that the Fs that are G "greatly exceed" the Fs that are non-G. Peterson's semantics, however, commits him to the untenable conclusion view that *most* and *many* are duals, so that "the denial (negation-*qua*-contradiction) of 'Most are' is 'Many are not'" (1979:163). This fails to account for the compatibility of *Most Massachusetts voters are Democrats* and *Many Massachusetts voters are not Democrats*. For Peterson, *Most S are P* is true iff *Few S are not-P*, yet the former can be true and the latter false: most senators are Republicans (in fact, 55% currently are) but it is not true that few senators are non-Republicans.

More interesting is the recent reanalysis by Ariel (2003, 2004, 2005), which concurs with the GAPP analysis in taking *Most S is/are P* to implicate 'a significant majority of the S is/are P'. Where Ariel departs from GAPP is in her approach to the upper bound. While rejecting the Petersonian entailment from (36a) to (36b), she maintains that "the fact that we can use *most* when 'all' is true should not force us to assume that the coded meaning of *most* covers 'all'" (Ariel 2005:66). Instead, *most* is upper-bounded as well as lower-bounded by its semantics, as indicated in (38a) (her formulation), or alternatively in (38b):

(38) a. Most F are G = '51-99% of (the) F are G'

b. 50%<most<100%

Ariel adduces anecdotal and experimental evidence indicating that speakers are uncomfortable asserting *most* when *all* is (or should be) known to be the case. One nice example would be (39), a quote widely attributed to George W. Bush which unfortunately turns out to be apocryphal.

(39) The vast majority of our imports come from outside the country.

An actual citation that supports Ariel's point appears in (40), which I excerpt from a thread on an e-mail support list for mantle-cell lymphoma devoted to the topic of possible sources for this disease. Note that yyy's use of *most, if not all* can only be understood as an instance of ironic understatement.

(40) #*most if not all* when "all" is known [emphasis added]

```
> From: [xxx]
> To: <Mantlecell@ucsd.edu>
> Sent: Thursday, June 26, 2003 10:53 AM
> Subject: Causes of MCL [Mantle Cell Lymphoma]--Sex?
>
> Something no one on our group has talked about is the
> fact that everyone diagnosed seems to have been sexually
> active.

Date: Thu, 26 Jun 2003 15:04:10 -0400
From: [yyy]
Subject: Re: Causes of MCL--Sex?
```

> Another seemingly pervasive factor is that **most, if not all,** of the members of this list breathed prior to contracting this disease.....maybe a connection?

But what do we make of the inappropriateness of *most* when 'all' is known? For Ariel, as noted, the upper bound of *Most F are G* is semantically specified – *most* "codes a range with both lower and upper bounds" – while the lexical meaning of *most* is compatible with *all* (ceteris paribus). Ariel argues that in many contexts, such as the use of (36a) as a peace activist's bumper sticker, the endorser of the *most* claim cannot plausibly be taken to be implicating 'not all', which would defeat her purpose by weakening the point being made.

But it must be recognized that in other cases we DO implicate what harms, if not defeats, our local purpose. Consider, for example, the following cases, in which someone who utters the (a) sentence would normally implicate its counterpart in (b), although this inevitably damages the effectiveness of the move in question.

(41) a. My, that goat's liver, eel, and raspberry custard was certainly interesting.
b. The custard was not particularly appetizing.

(42) a. You really should date my cousin, who is intelligent and good-looking.
b. My cousin is not stunning.

(43) a. I'm very fond of you, you're very special to me – let's go to bed together.
b. I don't love you.

Similarly, while it may well harm one's immediate short-term argumentative goals to communicate the fact that *not all Fs are G*, the maxim of quality (inter alia) demands that one concede this point, and hence to intentionally (if reluctantly) communicate it. Indeed, under such circumstances, it's safer to IMPLICATE the bad news rather than to ASSERT it as part of what is said. The generalization can be given as a codicil to the quality maxim:

(44) Don't say what you believe to be false – especially if you believe the hearer is in a position to find out.

Another argument Ariel advances against an implicature-based account of the upper bound of *most*-statements is based on a perceived similiarity between *most* and the cardinals. Now, the strongest evidence for the distinction between cardinals and other scalars is that a simple negative answer to a general scalar question, as opposed to one involving a scalar value, always returns a 'less than' meaning, since this context selects descriptive and not metalinguistic negation. But note that in (45), B's negative response to A's *most* query commits him to the proposition that 50% or fewer passed, not to the disjunction that either 50%-or-fewer passed or else all of them did, yet it is that very disjunction that (45B) ought to assert if it negates "50%-99% of the students passed".

(45) a. A: Did most of the students pass the test?
b. B: No.

In (46), on the other hand, B must first figure out what A wants to know (‘at least 6’ or ‘exactly 6’?) before he knows how to answer her; his negative response below may commit him to either ‘fewer than 6 passed’ or ‘either fewer or more than 6 passed’, depending on the context.

(46) a. A: Did 6 of the students pass the test?
b. B: No.

Similarly, if on September 1, 1972 I engaged you in the wager reported in (47a), it is clear that once the Dolphins won all their games and finished a perfect 16-0 that season I won the bet. The same outcome applies in (47b), in the unlikely event that you accepted the proposed wager in the first place. But in (47c), where I bet on the cardinal, it is arguable whether I won, you won, or the bet is void in the absence of any prior agreement on whether we had understood ‘at least 10’ or ‘exactly 10’.

(47) a. I’ll bet you that the Dolphins will win most of their games this year.
b. I’ll bet you that the Dolphins will win some of their games this year.
c. I’ll bet you that the Dolphins will win 10 of their games this year.

In (48), *most*, like *many* and *some*, harmonizes with upward-oriented *almost* and excludes negative-oriented *barely* (see Horn 2002 for an account of the orientation of *almost* and *barely*).

(48) a. Most Michigan drivers exceed 70 mph, {almost/#barely} 75%.
b. Few Connecticut drivers exceed 70 mph, {barely/#almost} 20%.

Similarly, to take some of the diagnostics for semantic content vs. implicature that trace back to Karttunen & Peters (1979), in (49a) I’m surprised that so many failed, not that some passed. In (49b), I’ve discovered that more than 50% of Israelis were pro-peace, not that fewer than 100% were.

(49) a. I’m surprised that most of the students failed the test.
b. I’ve just discovered that most Israelis support the peace initiative.
c. I’m surprised that Fran has 3 children.

On the other hand, in (49c), I may be surprised that Fran has at least 3 children OR that Fran has exactly 3 children, depending on the assumed context.

Other diagnostics support the status of *most*-sentences as unilateral, lower-bounded, upward monotonic predications: suspension and cancellation frames *(many if not most of the girls, not only most but all of the boys)*, selection of *and* vs. *but* in contexts like *many women and most men* vs. *few girls but most boys*, and so on. It appears that despite Ariel’s very interesting data and argumentation, there is a positive orientation of *most* sentences that her bilateral theory fails to predict, but that falls out directly from the classic Q-based scalar account. In addition, as we have seen, *most* patterns (mostly) with other inexact scalar values and not with the cardinals.

One last point is worth making with regard to some of the empirical results of Ariel’s studies and her conclusions based on them (Ariel 2005). As Ariel observes, a pragmatic analysis of *most of the Fs are G* would seem to predict that we should obtain similar intuitions about the truth

conditions of this sentence and *more than half of the Fs are G*. But in fact the respondents in her study tend to prefer *more than half* over *most* when a slight majority of the Fs are G, and to prefer it even more strongly when all the Fs are G, in which case *most Fs are G* is strongly resisted. Ariel sees these results as supporting an account on which "the same semantic status should be attributed to the upper bound as to the lower bound for *most* (but not for *more than half*)", while being inconsistent with the pragmatic theory on which both determiners are semantically unilateral.

Note, however, that the projection of implicatures in GAPP is based not simply on what is said, but from HOW it is said, as well as from what is NOT said. The implicature from *most* to 'not all', based on the scale in (37) operating over similarly lexicalized alternatives, is more robust (more "generalized") than the corresponding upper-bounding implicature from *more than half* to 'not all'. For one thing, in accordance with a general principle I have called the Division of Pragmatic Labor (Horn 1984, 1993; Levinson 2000), a speaker who goes out of her way to say *more than half*, eschewing the less marked and briefer *most*, must have a reason for so doing; marked forms are used in marked situations. One motive for using *more than half* may be precisely its compositional structure, which focuses on whether the proportion in question is less than, equal to, or greater than half of the set under consideration. This is likely to arise in situations involving near majorities or bare majorities. At the same time, if all that is relevant is whether a majority obtains, the presence or absence of totality is not necessarily relevant. These two factors explain why *more than half of the Fs are G* will be acceptable in many contexts in which either just 51% or 100% of the Fs are known to be G. But under these same two conditions, especially the latter, it is harder to imagine an acceptable use of *most Fs are G*, given that here the only relevant choice will be that between *most* and its informationally weaker and stronger alternatives (in particular, *all*). Of course, this does not make *most Fs are G* false in such a context; as predicted by GAPP, a such a sentence will be not only true but uttered appropriately as long as the speaker does not know that the *all* sentence is true when it is uttered (as in (47a) above).

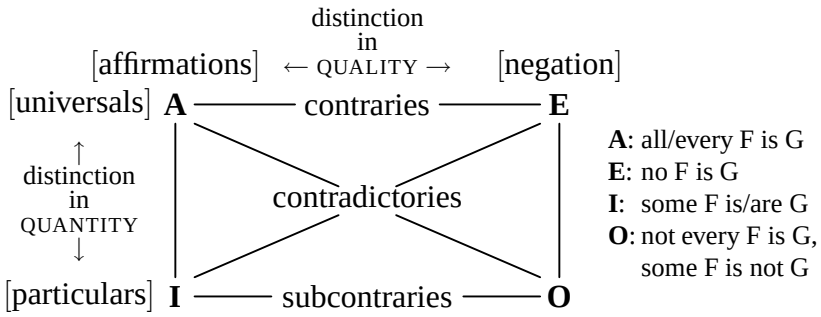
Thus, rather than refuting the pragmatic approach to the upper bound of *most*, the facts presented in Ariel's valuable research lend support to an account on which *most* is taken to be semantically akin to, yet formally distinct from, *more than half*; each imposes a semantic lower bound but no semantic upper bound on the subset described.[10]

5 Lexicalization asymmetries: ***nall* et al.**

The final front in the border wars we will be reporting on here involves an asymmetry in the lexical expression of logical operators. Recall the traditional square, repeated here in (50), and note in particular the subcontrary relation between the two particulars.

[10]In addition to the interpretational issues raised here, Ariel's data are arguably affected by the way her studies are designed, and in particular by the amount of information available to her subjects. See Papafragou & Schwarz (to appear) for elaboration, and for a different set of empirical results.

(50) SQUARE OF OPPOSITION



As recounted in some detail in Horn (1972:Chapter 4, see also Horn 1989:§4.5; Horn 1990), while the **A**, **E**, and **I** vertices of the Square can all be directly represented in the lexicon, the **O** vertex resists lexicalization, as schematized in (51):

(51)

	DETERMINERS/ QUANTIFIERS	QUANT. ADVERBS	BINARY QUANTIFIERS	CORRELATIVE CONJUNCTIONS	BINARY CONNECTIVES
A:	all α, everyone	always	both (of them)	both . . . and	and
I:	some α, someone	sometimes	one (of them)	either . . . or	or
E:	no α, no one	never	neither (of them)	neither . . . nor	nor
	(=all∼/∼some)	(=always∼)	(=both∼/∼either)	(=[both . . . and] ∼)	(=and∼)
O:	*nall α, *neveryone	*nalways	*noth (of them)	*noth . . . nand	*nand
	(=some∼/∼all)	(=∼always)	(=either∼/∼both)	(=[either . . . or] ∼)	(=and∼/∼or)

Thus, alongside the quantificational determiners *all*, *some*, *no*, we never find an **O** determiner **nall*; corresponding to the quantificational adverbs *always*, *sometimes*, *never*, we have no **nalways* (= 'not always', 'sometimes not'). We may find equivalents for *both (of them)*, *one (of them)*, and *neither (of them)*, but never for **noth (of them)* (= 'not both', 'at least one . . . not', i.e. the Sheffer stroke); we find connectives corresponding to *and*, *or*, and sometimes *nor* (= 'and not'), but never to **nand* (= 'or not', 'not . . . and').

These observations apply to natural languages only, both spoken and signed; it is significant that in electronic circuitry there are indeed NAND GATES, covering precisely the forbidden **O**-vertex meaning, just as it has often proved useful to define a set-theoretic operator XOR inspired by exclusive disjunction:

(52) "Exceptions" to constraint on lexicalizing **O** (or the conjunction of **I** & **O**):

a. **NAND**, a Boolean operator in programming languages:
p **NAND** q is true iff p and q are not both true

b. $x \in A$ **XOR** B *iff* $x \in A \cup B \,\&\, x \notin A \cap B$

Crucially, as pointed out in Gazdar & Pullum (1976), no bona fide representatives of the exclusive disjunction operator have surfaced in natural language.

GAPP treatments of the three-cornered square (Horn 1972:Chapter 2; Levinson 2000:69–71) attribute this asymmetry (surprise!) to pragmatic factors. The relation of mutual quantity implicature holding between the positive and negative subcontraries results in the superfluity of one of the two for lexical realization, while the functional markedness of negation (see Horn

1989 for a comprehensive review) assures that the unlexicalized subcontrary will always be **O** rather than **I**.

This asymmetry extends to the modals and deontic operators, as illustrated by the fact that the inflected negative in *A priest can't marry* only allows wide scope (**E** vertex) negation, i.e. the Roman Catholic reading, while the unlexicalized counterpart *A priest can not marry* is ambiguous, allowing both wide-scope (Catholic) and narrow-scope (Episcopalian) readings of the negation.[11]

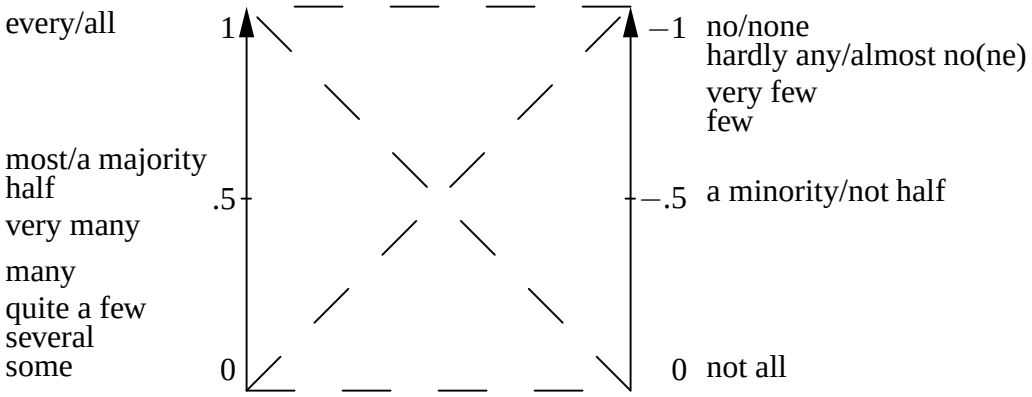
Since the account in Horn (1972), others have offered their own retellings of the story of ***O**. The blocking principle of Huybregts (1979) stipulates that *not Q* can lexicalize just when *Q not* can't, but this correlation fails to fully explain just when the latter state of affairs obtains. Barwise & Cooper (1981:186–87) propose the monotonicity correspondence universal, which predicts inter alia that strong determiners like *every* or *most* can incorporate inner but not outer negation; this correctly allows *neither* and *no* while ruling out **nevery* and **noth*. But without a grounding in the pragmatics of scalar operators, such approaches to the constraints on quantifier lexicalization are ad hoc. Worse still, any treatment based on the semantics of the determiners and quantifiers like that of Barwise & Cooper (1981) fails to generalize to the binary connectives, modals, and other non-quantificational values. A more recent proposal along these lines is that of Hoeksema (1999), who, after reviewing earlier accounts, argues that the non-occurring **O** forms are not blocked by corresponding **I** forms, pace Horn (1972). Rather, he notes, neither of the likely sources that would yield lexicalized **O** quantifiers – the merger of an existential + negation or the reinterpretation of NPIs – is consistent with what is known of the plausible historical development. Once again, however, the considerations he raises, contributing factors though they may be, fail to extend to other scalar values that manifest an asymmetry in lexicalization.

Most recently, Seuren (2003:13) has advanced a new formalization of the Aristotelian Predicate Calculus on which **A**, **I**, and (sometimes) **A*** (= **E**) will have lexicalized representations but **I*** (the **O** of the standard square) does not. He argues that, contra the Gricean moral to the story I have drawn, "The question [of why there is no **nall*] is superfluous . . . an artifact of the defective way [the Aristotelian Predicate Calculus] was formalized by Boethius" and the other geometers of the Square.

But altering the representation does not explain the asymmetry in the lexical incorporation of negation. The GAPP-based approach predicts a generalization of the asymmetry to all operators that can be mapped onto the Square of Opposition, including time adverbs, epistemic and deontic modals, binary connectives, etc., and also extends to intermediate values, predicting e.g. that 'not many' can be lexicalized (as in *few*) but 'many not' cannot. Similarly, we can have *seldom* or *rarely* (= 'not often, usually not') but no comparable lexical equivalent of 'often not, not usually'. The constraint can best be understood via the arithmeticized square in (53),

[11] On the topic of Catholic priests, it's worth noting that the lexicalization asymmetry was recognized by St. Thomas Aquinas, who noted that whereas in the case of the universal negative (**E**) "the word 'no' [*nullus*] has been devised [sic!]", when it comes to the PARTICULAR negative (**O**) we find that "there is no designated word, but 'not all' [*non omnis*] can be used." (Aquinas *in Arist. de Int.*, Lesson X: Oesterle 1962:82–3)

(53)



in which the quantificational scale is overlaid on the traditional Square of Opposition (see Horn 1989:236ff.) and each (upward- or downward-entailing) scalar operator is situated at its semantic lower bound. (Similar squares can be defined for the quantificational adverbs, the alethic, epistemic, and deontic modals, and so on.) The relevant generalization is that a lexical equivalent of Q + neg is possible only when Q is above the halfway point on the positive scale.[12]

While the asymmetry in lexicalizing complexes associated with the **A**, **I**, and sometimes **E** vertices as against **O** is equally exhibited in all of these lexical domains, some domains are more equal than others (cf. van der Auwera 2001 for related discussion). The degree of asymmetry varies according to how closed the category is: strongest for connectives *(*nand)* and determiners/quantifiers *(*nall, *nevery, *noth, *nalways)*, somewhat weaker for modal auxiliaries (where *needn't* would violate the strong form of the constraint, albeit in a context in which, given the NPI status of *need* as a modal, no **E** reading would be possible), and weaker still (though still present) for ordinary adjectives (cf. *impossible* vs. *unnecessary*, where the latter but not the former is restricted to deontic, non-logical contexts).

In the case of verbs, alongside the sizable array of causative verbs that lexicalize the **E**-value complex 'cause . . . not possible' in (54a), we find only a couple of candidates for the corresponding **O**-style logical form 'cause . . . not necessary' (or 'cause . . . possible not') in (54b):

(54) a. 'cause to become not {possible/legal/moral}'

ban	enjoin	interdict	proscribe
bar	exclude	preclude	refuse
deter	forbid	prevent	veto
disallow	inhibit	prohibit	withhold

b. 'cause to become not {necessary/obligatory}', '{possible/legal/moral} not . . . '

excuse	exempt

Confirming the universal lexicalization preference for **E** over **O** values, a wide range of modal and quantificational complexes which appear (by morphosyntactic criteria) to represent **O** forms are in fact assigned **E** semantics. Russian *nel'zja* 'impossible, forbidden' should on etymological grounds denote not an **E** but an **O** value, since it derives from the negation of a (now archaic) root *l'zja* 'good, useful'. Similarly, the frozen English adverbial *not at all*, like its French cousin *pas du tout*, appears to have strengthened **E**-wards from its original source as the negation of

[12]See Löbner (1987) for a formal definition of this above-the-halfway-point property and Horn (1972:§4.3; 1989:§4.5) and Levinson (2000:§1.7) for related data and discussion on the lexicalization constraint.

a universal (positive *at all* survives in Irish dialect with the meaning 'wholly, altogether'). The evidence is even clearer in Old English, where the lexical item *nalles*, *nealles* – while appearing to challenge the constraint blocking **nall*-type determiners – is in fact attested only with the value 'no, not, not at all', never 'not all'. (Other OE quantificational expressions include *næfre* 'never', *næðor* 'neither, nor', *náht* 'nothing', *nán* 'no one, none', and *náhwær* 'nowhere', all occupying the **E** rather than **O** slot.)

The conspiracy toward simpler expressibility of **E** over **O** values is also supported by a well-attested **O** $>$ **E** semantic drift. The outer negation associated with a necessity predicate often seems to develop an inner negation reading, the contradictory of the **A** value strengthening into its contrary. This locus classicus of this development is the French construction *Il ne faut pas que tu meures*, lit., 'It is not necessary that you die' but actually 'You mustn't die'. As Tobler (1882) demonstrates, the *'unlogisch'* **E** reading co-existed alongside the compositional **O** sense for neg + *falloir* as early as the 14th century before evicting it altogether.

Other instantiations of the constraint on the direct expression of **O** values are the inner-negation ('prevent') reading of negated strong causatives à la *Il caffè non mi fa dormire* ('Coffee doesn't let [lit., doesn't make] me sleep') in such languages as Italian, Japanese, Turkish, Amharic, Czech, Jacaltec, and Biblical Hebrew, the unambiguous **E** readings required by negative-affixed adjectives like *improbable*, *unlikely*, *inadvisable* (compare the ambiguous unlexicalized counterparts *not probably*, *not likely*, *not advisable*), and the aforementioned tendency toward the strengthened "neg-raised" understandings of *I don't believe that p*, *I don't want to VP*, and so on.

The Gricean account of the three-cornered square is more general and more explanatory than the rival theories which either dismiss the asymmetry as uninteresting or restrict it to the determiners and quantificational operators while neglecting other operator types and intermediate values that can be mapped onto the Square of Opposition.

6 Final dispatch from the front

I have argued for a set of related conclusions for a variety of phenomena involving the treatment of meaning in natural language. In §1, I re-examine the evidence for recent accounts of (non-cardinal) scalar predications that posit truth-conditionally relevant implicatures or an enrichment of what is said. In §2, I challenge Chierchia's recasting of scalar implicature as part of the grammar on the basis of the apparent (but, I argue, nonexistent) parallel between implicature and negative polarity licensing. I also dispute the asymmetry between direct and indirect scalar implicature Chierchia associates with positive and negative sentences respectively. I defend classical Gricean approaches to the meaning of *or* and of *most* in §3 and §4 respectively; in each case, I maintain that a lower-bounded semantics and (where context permits) an upper-bounding scalar implicature, following from a general theory of cooperation and rationality, provides the most explanatory basis to account for the full range of data compatible with the formal diagnostics and the facts of acquisition. Finally, in §5, I revisit the asymmetry exhibited by the range of cross-linguistic lexicalizations of logical values that can be plotted on the traditional Square of Opposition; once again, I argue that a classical pragmatic account invoking the effects of scalar implicature offers the most successful general explanation of the phenomena in question.

If I have been successful, I will have shown that – to paraphrase Mark Twain's cable – the reports of the death of the neo-Gricean paradigm have been greatly exaggerated. To be sure, it has become clear in the post-GAPP era that much of the excitement in the study of meaning these

days transpires in the unstable borderlands between what linguistic content provides and what post-semantic inference accounts for. Classical Gricean implicature must be exploited enough – but not too much.

I take it that "Where Semantics Meets Pragmatics", the theme of the workshop that gave rise to this volume, was inspired by the original Border Wars between the forces arrayed under the flags of England and Scotland, beginning with the heroic exploits of Mel Gibson eight centuries ago at Bannockburn and culminating with the heroic but doomed last stand of the Scots under Bonnie Prince Charlie at Cullodden in 1746. It may well have been this latter battle that inspired Scotland's national poet Robert Burns to pen the immortal "Comin' Thro' the Rye", which appears in (55) in its familiar modern form. We see Burns's original verses on the right in (56).

(55) Comin' Through the Rye –
the revised standard version

If a body meets a body
Coming through the rye,
If a body kiss a body,
Need a body cry?

(56) Comin' Thro' the Rye –
the Robert Burns version

O gin [=if] *a body meet a body,*
Comin' thro' the rye;
Gin a body f—k a body,
Need a body cry.

Gin a body meet a body,
Comin' thro' the glen;
Gin a body f—k a body,
Need the warld ken.
(Burns [1800] 1964:144)

One's eye is drawn inevitably to the final line of each of Burns's quatrains, given in the form of rhetorical questions (or queclaratives, as Jerry Sadock (1971) would have it). We are now prepared to answer the optimally relevant rhetorical question –

(57) Where semantics meets pragmatics
Cuttin' up the pie;
If semantics . . . kiss pragmatics,
Need pragmatics cry(?)

– with an unalloyed and fervent "NO!" and with the reminder that even in London, far below the Tweed, one is firmly instructed to. . .

(58) Mind the GAPP!

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A 'JUST THAT' LEXICAL MEANING FOR *most*

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1 Introduction*

Following Horn (1972), the lexical meaning assumed by the received view for scalar quantifiers such as *most* (namely, only lower-bounded) quite routinely underdetermines the meaning it is actually assigned by interlocutors (upper-bounded as well). Linguists prefer to derive the upper bound as a conversational implicature. *Most* is said to code 'more than half', but since the speaker simultaneously generates a 'not all' implicature, the conveyed meaning is both lower and upper-bounded ('more than half, but not all'). The pragmatic inference which provides the upper bound must be "default", because it is commonly needed for interpreting *most*. A pragmatic inference is then required in order to bridge the gap between the lexical meaning ('more than half') and the conveyed meaning of *most* ('more than half, but not all'). While Grice's 1975 work has made it obvious that conveyed meanings are often mediated by pragmatic enrichments of various sorts, it should be equally obvious that we should avoid such solutions for lexical items as much as possible. Such gaps should be assumed as a last resort, preferably only for cases involving ad hoc pragmatic inferences (Particularized Conversational Implicatures), and not for pragmatic inferences which seem almost obligatory (Generalized Conversational Implicatures). Being routinely generated, the pragmatic enrichment associated with *most* ('not all') is of the latter type. I argue below that we can account for all the interpretations of *most*, including ones the received view is incapable of accounting for, without assuming a gap between the lexical meaning of *most* and its prevalent interpretation. On my analysis *most* means 'a proper subset which is the largest subset, given any partitioning of the complement set (into one or more subsets)'. This is a 'just that' lexical analysis for *most*, namely, one where the extension denoted by its lexical meaning is just what its common conveyed meaning is: 'More than half and less than all'.

Consider the following, typical (1) and less typical (2) examples with quantifier *most*:

(1) **Most** (Israelis) decided for peace. Me too (Originally Hebrew, bumper sticker).

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(2) MONTOYA: . . . would you say that **most** of you,
without getting personal here,
are products=,
. . . uh=,
in terms of birth,
. . . of the sixties?
. . . **All** of you were born in the sixties? <SBC: 012>.

Example (1) is typical for my data in that the addressor is trying to convince the addressee to adopt some stance or action based on a generalization which holds true of some majority ("majority can't be wrong"). (2) is less typical, because *most* is more easily seen as compatible with the speaker believing that possibly all of his addressees were born in the sixties, as he indeed proceeds to indicate.

Most is associated with several different interpretations (I indicate in parentheses which examples the specific interpretation is relevant for):

(3) a. More than half (1+2).
b. Less than all (1).
c. Possibly all (2).
d. A noteworthy amount (1+2).[1]
e. (Based on d.): Some consequence/conclusion is being justified by the speaker, e.g., we should all decide for peace (1+2).

It seems quite obvious that interpretations (3d) and (3e) are pragmatically derived, whereas (3a), the lower boundary on *most*, is lexically specified. But what about (3b) and (3c)? The received view (ever since Horn 1972, see also Horn 1984, 1989, 2005) has been that (3c) is lexically allowed for: *Most* is only lower-bounded, and is therefore compatible with 'all' being the case, just as it is compatible with any value above half (e.g., 87%). (3b) is pragmatically derived as a scalar implicature, due to a comparison of *most* with the more informative *all* (on a conventional Horn scale), which the speaker could have used. Since she did not choose the more informative *all*, she must not intend 'all'.

Other lexical-pragmatic divisions of labor are also conceivable. Hamilton (1860) (as cited in Horn 1989:207) proposed an ambiguity analysis for *some*. We could propose a similar analysis

[1]To see that *most* tends to denote a noteworthy amount, observe the objection (in b) to the use of *most* (in a), just because the majority is rather small (`http://www.talkleft.com/new_archives/004742.html`, 12.20.2003):

(i) a. An ABC News poll shows that **most** people support a life over death sentence for John Lee Malvo, who was a juvenile at the time of the sniper attacks.
Given a choice, 52 percent say they'd prefer a sentence of life in prison with no chance of parole for Malvo, while 37 percent prefer the death penalty. (`http://abcnews.go.com/sections/us/WorldNewsTonight/malvo_death_penalty_poll_031219.html`)
b. Fifty two percent is **not "most"**.
(`http://www.talkleft.com/new_archives/004742.html`, 12.21.2003).

Presumably, the poster of (b) would find *more than half* a more appropriate description for 52%. The original use, I assume, views 52% as noteworthy, because the opposed view is only endorsed by 37% , rather than by 48% of the people surveyed.

for *most*, so that in addition to a lower-bounded meaning, it also has a bilateral meaning. For the bilateral meaning, both (3a) and (3b) are lexical, thus ruling out interpretation (3c) altogether. Since even (1), (where *most* is interpreted as upper-bounded), is not false should 'all' be the case, i.e., should all Israelis have decided for peace, we can safely dismiss the bilateral account.

I too have recently argued for a view which is (almost) the opposite of the received view, namely, that something like (3b) is lexically specified and that (3c) is mediated by pragmatic inference (see Ariel 2003, 2004). Based on 127 corpus examples (all the quantifier *most* examples in the Santa Barbara Corpus of Spoken American English, the London Lund Corpus and Morris 1994:71–192) and on questionnaire data (see also 2.2 below), I have argued that: (a) Pragmatics cannot provide the upper bound on *most*, and moreover, (b) Semantics should provide the upper bound on *most*. A 'just that' semantic analysis for *most* stipulates that its prevalent interpretation is also its lexical meaning. This article focuses on the second part of the argument, namely that semantics should and in fact can account for the upper bound of *most*, and that *most*'s compatibility with 'all' is only pragmatically enabled (but see also Ariel 2003, 2004).

A note is here called for on my repeated use of the term lexical, rather than semantic, and on how I understand the term upper bound(ed). My argument is that *most*'s lexical meaning is upper bounded, not that the semantic (i.e., truth-conditional) interpretation of *most* utterances is necessarily always upper-bounded. Following Relevance Theory (Sperber & Wilson 1986/1995), I take it that pragmatic enrichments (such as 'not all' or 'possibly all') can contribute to the truth conditions of propositions, and therefore can constitute part of the overall (referential) semantics of the proposition. Put differently, while the linguistic semantic analysis of *most* is upper bounded on my analysis, the referential semantic interpretation need not be so (see Carston 1999 for the concept of referential semantics). Here's a relevant example, where *most*'s referential semantic interpretation is 'at least most, possibly all', even though I maintain that its lexical meaning is upper bounded:

(4) The target date for the meeting is Jan. 17 in Los Angeles, provided **most** of the Hall of Famers can make it (International Herald Tribune, 12.24–25, 2002, p. 16).

Second, as will become clearer when I discuss the compatibility of *most* with 'all', I don't see the lexical upper bound on *most* as an 'all-exclusion' interpretation. In other words, when I say that *most* denotes less than all the relevant set, it does not follow that the predicate asserted to be true for *most* is necessarily false of the part not denoted. This would, of course, be the bilateral position which I am rejecting. More on this in section 3.

Before we address the main topic of this paper, I should briefly summarize the arguments made in Ariel (2004) for my claim that pragmatics cannot account for the (routine) upper bound on *most*. 'Not all' (of whatever strength) is not a frequent implicature in the data I examined. The reason is that the presumed implicature is either not relevant, or worse, it would actually undermine the speaker's communicative intent in uttering the *most* proposition. I argued that 'not all' is relevant and communicated only when there is an expectation for 'all' to be the case. As it turns out, we don't normally have such high expectations. We don't expect to be able to generalize over all instances. *Most* is considered a very significant amount, one we can build on in justifying consequences following the *most* proposition (this is especially clear in ads stating that most people prefer some product). Note that generating the 'not all' implicature actually defeats the speaker's purpose in using the *most* proposition, since the minority 'not all' set of instances actually constitutes a counter-example to the speaker's point. Speakers usually use the

most proposition in order to support some further action/conclusion they wish to convey. In the typical (1), for example, the addressor would like to convince all Israelis to decide for peace. The majority of Israelis are the example-setters for all of us in this case. The addressor certainly does not want us to follow the example set by the minority group of Israelis who did not decide for peace (see Ariel 2004 for more examples and discourse statistics). Nonetheless, in these very cases where no implicature is generated, *most* is seen as upper-bounded. Since it relies on implicature generation, the received view, I argued, cannot account for the prototypical *most* cases.

In response to these findings, Horn (2005) insists that an implicature is generated. He proposes to shift the basis of the scalar implicature to the Maxim of Quality, in order to defend his original position that the upper bound on *most* is pragmatically derived in these cases.[2] On this revised view, *most* conveys 'not all', because otherwise, using *most* when 'not all' is the case violates Quality (the reason is that *most* is also compatible with 'all', which is here false). There are a few problems with this position. First, it means that 'not all' is always inferred by the addressee, regardless of its relevance (unlike the original proposal). Scalar implicatures can never be cancelled implicitly by context (as in (2), even before we hear the last sentence). Second, it is not clear to me how using *most* is a breach of Quality under the received view. If under the received view *most* denotes 'more than half' then it cannot be false for 'most, but not all' cases. The fact that it allows also for the 100% value to be true, which is false in this case (say we're talking about 85%), is quite parallel to the fact that *most* also allows it for 75% to be true, even though it is false in the assumed case. No one would want to say that *most* violates Quality in such a case. I think that the problem is that semanticists and pragmatists have singled out the 100% value as the only relevant value worthy of consideration when scalar quantifiers are accounted for. A clear Gricean case of Quality violation are ironies, where what the speaker asserts is blatantly false, in which case the addressee reasons that the speaker actually wants to convey something different and truthful. A speaker using *most* when 'not all' is the case cannot, however, be seen as saying anything false, and hence, I don't see how Quality has been breached by such a speaker. The use of *most* can only be seen as less than maximally informative on the Neo-Gricean account, and hence, must generate a Quantity implicature, which is cancelable by Relevance. This has been the original Neo-Gricean position (see also Levinson 2000), and for a good reason.

Third, even if my two arguments above fail, all things being equal, we should avoid the assumption of a conversational implicature (Generalized conversational implicatures included) which must routinely apply in violation of Relevance (the counts reported on in Ariel 2004 are that for at least 74% of the *most*s in the data the implicature would have to be generated despite its irrelevance and counter-productive effect in the conversation). Even if both the received view and my circumbounded view can account for all the data, it seems preferable to involve pragmatic inferencing in the minority of the cases (at most 26%), rather than in the majority of the cases.[3]

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[2]Horn argues that we sometimes implicate information against our best interest, but I have argued in Ariel (2004) that those cases are interactionally quite different from the unmarked *most* case. The "reluctant" implicatures are all cases where the more informative term (*all* in our case) is expected. This is precisely not the case in the unmarked *most* utterance. See Ariel (2004) for details.

[3]While agreeing with me that we should reserve implicatures to the minority rather than to the majority cases, one of my referees counters that it is possible that once we include other 'not all' implicatures, for *some*, for example, implicature generation may turn out to be more frequent than nongeneration. First, contra current aspirations for as elegant a grammar as we can devise, I am not committed to imposing uniformity of analysis on different expressions.

The reason is that wherever possible, we should opt for a 'just that' lexical meaning, i.e., one where "what you see as the actually conveyed meaning – 'more than half, but less than all'– is what you get – as the lexical meaning". Last, as I argue below, it is not just that pragmatics cannot account for the upper bound, and that it should not, because of the reasons just enumerated. I claim that the upper bound on *most* should be lexically specified, because questionnaire results (initially reported in Ariel 2003, but see also 2004 and 2.2 below) attest that the upper bound on *most* is lexically given.

The structure of this paper is as follows. Section 2 presents my lexical analysis for *most*, and cites two different types of arguments for it (2.2, 2.3). I then address possible difficulties with the proposal, namely, *most*'s compatibility with 'all' (3), and the alleged difference in unilaterality between numbers and scalar quantifiers (4). Section 5 discusses the possibility of doing away with the lower bound on *most*. We conclude with section 6.

2 A 'just that' semantics for most

2.1 A new lexical meaning for *most*

I propose below that the set of entities that *most* picks for predicating on, as specified by its coded meaning, includes any value larger than half, but smaller than all (51–99% for short). There is, of course, no controversy about the lower bound of *most* (but see section 5 below). The question concerns the maximal value that *most* can code. I propose that the maximal value for the entities picked for predication is 100% minus something. While I am proposing a(n upper) bounded range analysis for *most*, unlike the bilateral analysis, I assume that the coded meaning of *most* does not specify anything about the complement minority. It certainly does not entail that the predicate does not apply to 'all'.[4] The complement may or may not then share the property predicated on the majority set, in which case it could have theoretically formed part of the same set in reality (as allowed for by the unilateral approach – see section 3 below).

When the speaker says *Most Israelis decided for peace*, *most Israelis* represents a set of Israelis, which constitutes 51–99% of another, larger set of all Israelis, and it is about this proper subset that 'decided for peace' is predicated on. The complement minority set of Israelis not included under *most* is not denoted at all, and at the lexical-semantic level, the speaker undertakes no commitment regarding the application of the predicate to these Israelis: If they are not referred to by the speaker, she is (lexically) committed neither to the predicate not applying to 'all' nor to the predicate possibly applying to 'all'. This is where my analysis is crucially different from the standard semantic analysis of *most* (see Keenan 1996), which commits the speaker to relying on knowledge regarding whether or not the predicate (e.g., 'decided for peace') is or is not true

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Equally controversially, I will not be surprised if we eventually find out that all scalar expressions are lexically circumbounded, just like *most* is.

[4]This is why the following, from Horn (2005:ex. 49a) does not argue against my analysis:

(i) I'm surprised that **most** of the students failed the test.

Since the interpretation of (i) is not the speaker is surprised that '**not all** the students failed . . . ', he concludes that 'not all' is an implicature rather than part of the semantic meaning. But of course, my analysis has an upper bound, not an 'all-exclusion' component in the lexical meaning, so I don't predict what he attributes to me. Rather, on my analysis, the speaker is surprised that the profiled reference set (extensionally, between 51–99% of the students) failed.

for all Israelis. On the standard analysis, it's either the case that the speaker knows that there definitely are Israelis that did not decide for peace (but there are less of them than there are of Israelis who did decide for peace), or that there are none. First, I do not think that these assumptions are realistic. It's unrealistic to expect speakers to know what exactly counts as *decide for peace*, and who exactly it is true/false for. Second, and even more importantly, the account fails to distinguish between the profiled reference set and the nonprofiled complement, since both figure in the definition. Figure 1 may help the reader visualize what I have in mind:

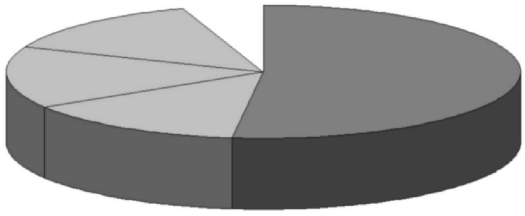

Figure 1: The lexical meaning of *most*

Note that more than half of the ellipse is highlighted. The bare minimum (lower bound) is colored dark gray, and the rest of the potential *most* range is colored light gray. The complement of *most* (the white space) is not only not highlighted, it's simply not there. Nothing is predicated on it, because it is not being denoted. At the **lexical** level, the status of the complement set is similar to that of any irrelevant referent (e.g., *some Americans* when (1) is uttered). The meaning I am proposing for *most* is indeed bilateral, but it is not identical to the bilateral interpretations assumed in the literature (neither the Hamilton 1860 style lexical meaning nor the commonplace conveyed meaning). 'All' is not included under the predication, but neither is 'not all'. This is why I prefer the term 'circumbounded' over 'bilateral'.

What I am proposing for *most* parallels Kadmon's (1987; 2001:68–76) analysis of the meaning of numbers for the most part. Kadmon argues that *four* codes 'a set of four', rather than 'at least four'. The former meaning is nonetheless compatible with an 'at least four' reading (i.e., where 'five' is true), because even though the NP stands for a set that contains exactly four entities, it is possible that there are additional entities bearing the same property outside the set.[5] An argument adduced by Kadmon is that under an 'at least' analysis for the numbers, it is not clear why *at least four* would not also convey 'exactly four' (with the addition of a scalar implicature). After all, implicatures are generated based on semantic meaning, contextual assumptions and Gricean Maxims (due to nondetachability). Since under the unilateral analysis, the semantics of *four* and of *at least four* is the same (namely, 'at least four'), assuming a constant context and Grice's Maxims (invariant, of course), we should produce the same reading for the two expressions. But of course, this is not the case.[6] Kadmon herself explains the difference by noting that adding on the scalar implicature in the *at least four* case would still not result in an 'exactly'

[5]I thank Nirit Kadmon for calling my attention to the similarity between my proposal for *most* and her analysis of the cardinal numbers. Kadmon, however, does not distinguish between the bounded lexical meaning of 'a set of exactly x' and the 'at least x' reading, because the latter is truth-compatible with the former. Still, unmodified by a scalar implicature, the coded meaning she proposes for the numbers gives rise to a bounded interpretation (just like *most* under my analysis), since it profiles a set of exactly n entities.

[6]The only way to distinguish between the implicatures of identical semantic meanings is by reference to the Maxim of Manner. *Four* and *at least four* can be seen as differing in brevity, the longer form reserved for the more marked

reading (for even if there are no additional entities bearing the same property outside the set, the set itself is not restricted to four). This argument applies to (*at least*) *most* as well. *Most* too must be distinguished from *at least most*, as in the following:

(5) But, I believe that most authors are counting on **at least most** of the audience having some common points of reference (`www.sondheim.com/commentary/collective.html`, 1.18.2002).

Similarly, we can argue, following Koenig (1991) (who restricted his point to the numbers), that only by assuming a circumbounded meaning for *most* can we analyze *at least most* and *at most most* symmetrically and compositionally, even if they are rather rare in discourse (Koenig attributes this argument re the numbers to Kay 1989, and see also Geurts 1998).

How should we characterize this extension of *most*? One possibility is to say that *most* codes 'close to all'.[7] Since 'all' and 'none' are obvious landmarks for assessing quantities, 'close to all' means that the quantity denoted is any majority, starting with the minimal 50% plus something.[8] I tend to prefer an alternative definition, according to which *most* means 'a proper subset which is the largest subset, given any partitioning of the complement set (into one or more subsets)'. Like 'close to all', this meaning too embodies both the upper and the lower bound. The upper bound is secured since the set denoted by *most* is a proper subset (so *most* cannot denote 'all'). The lower bound is in place since the denoted set must be the largest subset, no matter how we partition the nondenoted complement. In order to constitute the largest (proper) subset, regardless of how many complement subsets there are, *most* must denote a set larger than 50%, for only such a value will be the largest even if the complement of the denoted set is taken as a single set (If the complement is taken to constitute two or more subsets, a lower percentage than 51% may constitute the largest subset, a possibility excluded under this analysis). For an alternative formalization of my proposal, see Appendix A.

This definition has a few advantages. First, it shows the current meaning to be a narrowing down of the historical meaning (something like 'the **greatest** part' Cf. French *la plupart*), and it also connects with superlative *most* ('to the **greatest** extent'). The semantic change is simply the addition of 'given the partitioning of the complement into **any** number of subsets'. Alternatively, the semantic change can be seen as an imposed reduction of any partitioning to a binary one. If there are only two subsets (one for which the predicate is asserted to hold, the other, its complement), then the larger subset must constitute at least 51%. The second advantage of this characterization is that with pragmatic loosening we can naturally account for certain uses of *most* as plurality, where it denotes the largest subset even when its value is lower than 51% (see section 5 below).

Assuming a circumbounded meaning for *most* makes for a more natural coded concept. Koenig (1991) finds it strange to assume that all languages choose not to code specific (circumbounded) numbers (as opposed to lower-bounded-only numbers). I find it equally strange to

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reading ('at least four'). But then, the intuition is that it is the meaning of *at least* which contributes to the 'at least' meaning, and not merely the fact that it is longer.

[7]Of course, this does not mean that *most* and *close to all* are paraphrases and discoursally interchangeable. As Bernard Comrie (p.c.) notes, *close to all* is restricted to large majorities.

[8]Note that some researchers consider *close to* or *near* to also include identical (in location). For example, Levinson (2000:96) assumes that *X is at the station* entails *X is near the station*. I do not think that that is the case in general, and do not intend close to above to be interpreted in that way.

assume that all languages choose not to code circumbounded range quantifiers (such as 'most'). 'At least most' is not as natural a concept to be lexicalized by a monomorphemic lexeme (Cf. the complex *more than half, at least half*). Thus, even if it does not make any wrong predictions, the burden is on those who wish to support the lexical unilateral meaning to show why it is necessary to assume such an abstract, counter-intuitive meaning. All the more so if, as I believe, the circumbounded assumption accounts for facts which the received view fails to account for (the discourse data analyzed in Ariel 2004, the questionnaire data discussed in 2.2 and 3.2, and the wise-guy examples in 2.3).

Next, the circumbounded meaning of *most* does not feel as a derived, indirect interpretation, split into a lexical component vs. a pragmatic enrichment component. Rather, it feels as one unified meaning. This intuition is shared by some unilateral analysis proponents. Geurts (1998:105) repeatedly states that "we simply do not know if scalar expressions license bilateral interpretations on a regular basis", and that not many contexts make the bilateral interpretation relevant (he discusses *bright* in this connection). In other words, Geurts, who does not endorse my view, feels that the 'all'-exclusion implicature is not often generated. I doubt he can then support the implication from his claim, namely, that in most cases it is the unilateral ('at least') meaning which is relevant (see the data in Ariel 2003, 2004). But if so, how can the interpreted upper bound come about on the received view? Chierchia & McConnell-Ginet (1990:194), again proponents of the unilateral view, also undermine the implicature analysis when they say that "scalar implications ... often seem completely direct in the sense of being **part of what the speakers mean**" (emphasis added). I think that Geurts' intuitions are right on target for the 'all'-exclusion interpretation (it is indeed a rare pragmatic implicature). And I think that Chierchia and McConnell-Ginet's intuitions are quite correct about the upper boundedness of *most* (this is the unmarked **conventional** interpretation of *most* – see Ariel 2004).

The main advantage of my analysis of *most* is that it is a 'just that' semantic analysis. This contrasts with the received view, which I find to be a 'surplus semantics' one, where a surplus interpretation ('possibly all') is included, only to be eliminated in the majority of cases. Under a 'just that' analysis, *most*'s prevalent interpretation (upper-bounded, but not necessarily 'all'-excluding) is assumed to be its lexical meaning. Its compatibility with 'all' is not automatically guaranteed, and requires pragmatic mediation (see section 3). I should emphasize, however, that 'all-exclusion' and 'possible all-inclusion' are both potential Particularized Conversational Implicatures, generated in a minority of the cases (see Ariel 2004). I now present empirical evidence for my claim that *most* is lexically upper bounded (2.2, 2.3).

2.2 Questionnaire results

In order to help adjudicate between the received unilateral view and my circumbounded proposal, I designed a questionnaire whose goal was to determine whether *most* is lexically upper-bounded. To establish this, I compared people's understanding of *most* with their understanding of the unilateral term *more than half*. Under the received view, both expressions are lexically unilateral, whereas on my view, *most* and *more than half* have distinct lexical entries. In particular, my view predicts that subjects should reject the possibility that by saying *most* the speaker could have intended 'all'. The received view predicts that subjects should be reluctant to confirm 'all' because of the default scalar implicature, but that when pressed to cancel it, they will accept an 'all' interpretation. This is precisely my prediction for *more than half*, which pragmatically disfavors high values, 'all' in particular (see Ariel 2003 and Figure 2). Subjects should be reluctant

to select 'all' as *more than half*'s interpretation, but when pressed, will do it. On the received view, speakers using *more than half* do not generate the 'not all' implicature, and hence, they should have no problem accepting an 'all' interpretation for it.

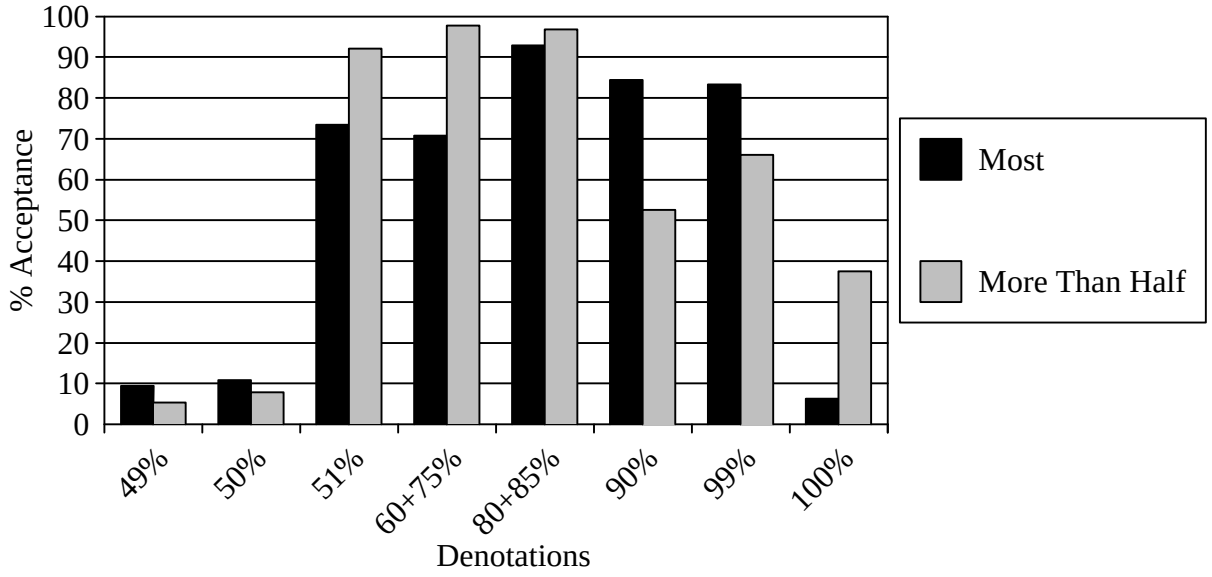

Figure 2: *Most* vs. *More Than Half*

I constructed a questionnaire in Hebrew, in which subjects were asked to determine whether certain values (e.g., 49%, 50%, 51%, 60%, 80%, 90%, 100%) were possible extensions of *most*. One group of 32 subjects was asked about Hebrew *rov* 'most', and another (19 subjects) about Hebrew *yoter mexaci* 'more than half' (for a detailed analysis of the results see Ariel 2003). (6) is one such question (each group receiving only one version):

(6) **Most/more than half** of the students in the class were born in 1970.
How many students could the speaker mean?

a. 100% of the students.
b. 20% of the students.
c. 50% of the students.
d. 49% of the students.
e. None of the above.

The results for the 3 questions including a 100% value are very clear (see Figure 2). The difference between the acceptance rates for 99% and for 100% as values for *most* is absolute, in fact, more so than for the lower bound, between 50% and 51% values. The great majority of subjects (93.75%) failed to confirm that the speaker of *most* could possibly intend a 100% value, just like they did for the 50% value (89.1%), even though many of them confirmed that the minimally different 99% and 51% are possible extensions of *most*. Moreover, the fact that subjects refrained from accepting 100% values for *most* cannot be explained by some absolute (pragmatic) aversion to the maximal value, because an impressive minority of the subjects did accept the 100% value for the Hebrew *more than half* (37.5%). Crucially, a pragmatic tendency cannot explain the different acceptance rates for the 100% value between *most* and *more than half*, for in general, (and

this is maintained up to the 99% level) it is *most* which tends to pick higher values (see Ariel 2003, 2004 and Figure 2).[9]

Obviously, questionnaire results can directly attest only to conveyed meanings, whereas I was interested in getting at the lexical meaning. I believe I overcame this obstacle, first, by not only instructing the subjects on the written form to circle **all** legitimate answers, emphasizing that even remotely possible ones were to be included, I also repeatedly emphasized it orally, even as they were filling out the questionnaire. Here's what the written instructions specified:

(7) . . . It's possible that **several** of the answers are appropriate. In such a case you should choose **all** the answers that the speaker might have considered possible, **even if chances for it are slim in your opinion** (original emphases).

Second, I always compared the results for *most* with those for *more than half*, which was used in exactly the same context. Note that an 'all' avoidance is attested for *more than half* as well. A majority of my subjects did resist an 'all' interpretation for *more than half* – 62.5% of them. Indeed, such a rejection rate represents a strong pragmatic tendency. A 93.75% rejection rate, however, reflects an absolute rejection.[10] Third, I included questions where subjects were forced to suppress their pragmatic preferences. Question (6) cited above is one such case. It is then especially instructive to examine the results for it separately. If the received view is correct, then there should have been a substantial rate of acceptance of the 100% value for this question. First, based on world knowledge, it is quite plausible that all the students in some class were born in the same year. Second, options (b), (c), and (d) all violate the semantics of *most*, and it is quite clear that my subjects were quite reluctant to violate the semantics of *most*. According to the received view, all they had to do was cancel the 'not all' implicature.

Note that my method of forcing subjects to suppress their pragmatic practices was quite successful in general. For instance, when I posed a *most* question with the following values as answers: (a) 0%, (b) 15%, (c) 51%, (d) 46%, (e) none of the above, most subjects selected the 51% value (26/32, 81.3%), even though 51% is clearly a dispreferred pragmatic value for *most* (chosen by only 65.6% when a better option was also available, see Ariel 2003). This was so despite the fact that subjects were encouraged to circle as many options as they could. Similarly, when the potential answers for *more than half* and *most* were only (a) 97%, (b) 98%, (c) 99% and (d) 100%, subjects were willing to assign both expressions very high values (e.g., the rate of acceptance of 97%–99% was 88.9% for *more than half*), even though in other questions these high values received significantly lower rates of acceptance for both expressions (especially for *more than half*). Thus, the subjects I tested could certainly suppress their pragmatic preferences when forced to.

Given that subjects can be forced to select pragmatically dispreferred answers when no semantically viable answers are provided, one would expect subjects to choose (a) for (6), assuming that the speaker intended to cancel the 'not all' implicature, but maintaining the semantic lower boundary. After all, pragmatic implicatures are supposed to sometimes get cancelled, whereas

[9]Hans Smessaert (p.c.) also notes that *most* is "stronger", as he puts it, than *more than half*, so that one can say ∼*more than half if not most*, but not ∼*most if not more than half*.

[10]One of my referees objects to my saying that these rates constitute an absolute rejection of the 100% value, because it's not rejected in 100% of the responses. However, if we require 100% responses, I'm afraid we'll never find anything solidly semantic (see Table 1 below, where over 10% of the responses violated the semantic lower bound on both *most* and *more than half*).

semantic meanings are assumed not to. Indeed, for the counterpart *more than half* question in (6), many subjects did just that. 8/19 (42.1%) chose the 100% value, even though *more than half* pragmatically disfavors high majorities in general, and 100% in particular. This is not at all what I found for *most*. First, a majority of 26/32 (81.3%) chose answer (e) (Cf. 57.9% for *more than half*), equally rejecting the semantic violations (20%, 49% and 50% values) and the supposedly semantically legitimate option (the 100% value). This is a very high proportion of subjects choosing 'none of the above'. For a similar question where the options were: 30%, 99%, 40%, 0% and none of the above, only 7/32 (21.9%) chose 'none of the above', even though 99% too is a pragmatically dispreferred value. The same happened for a question where the pragmatically dispreferred 51% was the only semantically viable option. Only 6/32 (18.8%) opted for 'none of the above' option here.

Now, although 3/32 subjects (9.4%) did select a 100% value in (6) for *most*, the same number of subjects actually accepted 49% (2/32, 6.25% also accepted 20% as a value). Even the semantically illicit 50% responses were more frequent than the 100% responses (5/32, 15.6%). All in all, 10/96 (10.4%) answers selected some semantically impossible option (20%, 49%, 50% values), as compared with 9.4% selecting 100% values. In other words, there were about the same number of semantically inappropriate responses as "pragmatically" inappropriate responses. For *more than half*, on the other hand, while a similar ratio of responses selected were semantically inappropriate (10.5%), a much higher ratio of responses were pragmatically inappropriate, (42.1%), 300% more. It seems therefore that for *most* (but not for *more than half*), the acceptance rates for the 100% value, even in the most favorable conditions, are as low as the acceptance rates for the ungrammatical lower values (below 51%). Table 1 gives the relevant data for question (6):

Violation type	***Most***	***More than half***
Semantic, lower bound (20%, 49%, 50%)	10/96=10.4%	4/38=10.5%
"Pragmatic" (100%)	3/32=9.4%	8/19=**42.1%**

Table 1: Rate of semantic and pragmatic violations for *most* and *more than half*

Clearly, one and only one result stands out in Table 1: The acceptance rate for a 100% value for *more than half*. The other acceptance rates are virtually the same. It is unreasonable that the same pragmatic violation is rather frequent in one case (the acceptance of 100% with *more than half*), but quite marginal in another case (with *most*). It's even more amazing that whereas the so-called pragmatic violation for *most* is so different in frequency from the pragmatic violation of *more than half*, it is nonetheless identical in frequency to the semantic violations of both *most* and *more than half*. A more plausible analysis would group the three very low results together as reflecting the same, semantic ban, in contrast with the fourth, pragmatic result which stands out. Under my analysis, all semantic violations are marginal (9.4–10.5%), whereas the one pragmatic violation is not (42.1%). The conclusion must be that the 100% value has the same status as 49% and 50% values for *most*: It is ruled out lexically.

Laurence Horn (2005) counters that only *most* stands in pragmatic opposition with *all*, hence the strong avoidance of 100% values for *most*, but not for *more than half*. I doubt this. *More than half* too stands in contrast with *all*, as can be seen from the difference between the rates of acceptance for the minimally different values 99% and 100% for *more than half*. While the drop from 99% to 100% is by far smaller for *more than half* than for *most*, it is still a large difference (66.1% vs. 37.5% acceptance rates – these are the overall results for 100% acceptance

– see Figure 2). In other words, the majority rejected 'all' as an interpretation for *more than half*, and they did so far more often than they rejected 99% as a value. Even when 100% was the only semantically viable answer (as mentioned above), 57.9% of the subjects refrained from selecting it as a potential value for *more than half*. These results demonstrate that *more than half* too is pragmatically taken to stand in contrast with *all*. Yet, this pragmatic preference is overcome in a substantial minority of the cases. The counterpart ban for *most*, however, is not similarly lifted. This differential behavior is unaccounted for on the received view.

The results from the following, different set of questions, testing the truth-compatibility of *most* and *more than half* with 'all', testify to the same phenomenon (see 3.1 below for the difference between coded meaning and truth-compatibility):

(8) Galit's neighbor is giving a big party tonight, and Galit told him that she is willing to lend him **most**/**more than half** of the chairs in her house. "They're in the dining room. You can come (pick them up) in the afternoon already".

The neighbor knows that Galit is willing to lend him **all** the chairs in her house. How is he to interpret her words "They are in the dining room"?

A. **All** the chairs that Galit has in her house are in the dining room.

B. **Most**/**more than half (but not all)** the chairs that Galit has in her house are in the dining room.

This is a context where implicature cancellation is expected, since we are told that the reality is that Galit is willing to lend **all** her chairs. According to the received view, we then expect confirmations of 'all'. Still, only 7/12 (31.8%) of the subjects asked about *most*, chose Answer A, and similarly, 4/11 (36.4%) of the subjects asked about *more than half*. Crucially, the majority chose Answer B for **both** *most* and *more than half*. This means that a similar majority avoided the 100% value for both *most* and *more than half*, even when they were told that 'all' was the case. Even in the one question where there was a difference between the two expressions, and *more than half* was seen as compatible with 'all' 1.75 times more than *most*, only 63.6% of the subjects confirmed that *more than half* is compatible with 'all'. Clearly, *more than half* too pragmatically disfavors 'all'.

Finally, consider another implicature generation + cancellation case (this question is part of a later questionnaire in Hebrew I administered):

(9) Iddo: Dana solved **all** the problems.
Maya: **More than half** of them.

This is a case where the 'not all' implicature does not depend on *more than half* participating in a Horn scale. Rather, due to the opposition between *all* and *more than half*, Maya is implicating 'not all'. Is Maya's claim true/did Maya tell the truth in case Dana solved all the problems? Since 'not all' is only implicated, we would expect subjects to say that Maya's proposition is true. Indeed, two thirds (14/21) said that 'Maya's claim was true' and almost half (7/15) even chose the same answer for the question, 'Did Maya tell the truth?'. On average for the two versions, only 27.8% (10/36) said that it wasn't true (Others chose 'impossible to know'). Now, if *most* too only implicates 'not all', we should expect similar results for the counterpart *most* utterance by Maya. But in fact, results are reversed for *most*. 30/38 subjects (79%) who responded to either version of

the truth question determined that Maya's contribution was not true (only 4, 10.5% said Maya's claim was true, and another 4 chose 'impossible to know'). All in all, subjects chose 'not true' for *most* 2.8 times more than for *more than half*, and they chose 'true' for *more than half* 5.5 times more than for *most*. Now, the two cases (for *most* and for *more than half*) are pragmatically similar, both triggering an 'all' exclusion interpretation: In both cases Maya is seen as offering a counter-proposal, replacing Iddo's universal claim with a partial generalization. Note that in this case Horn cannot claim that unlike *most*, *more than half* simply does not participate in a Horn scale, and hence, does not trigger a 'not all' implicature, because the context makes it clear that the speaker is generating the scalar implicature from *more than half* here. The different effect of the 'not all' implicature must therefore be due to the different lexical meanings of *most* and *more than half*. I suggest that whereas in the case of *more than half* there is some incongruity between the lexical meaning (not upper bounded) and the pragmatically appropriate interpretation ('all' excluding), for *most*, there is no conflict. The lexical upper bound is simply strengthened into an 'all' exclusion commitment. In other words, I am proposing that the differential responses derive from the difference in the lexical meanings of the two expressions, and not from a different pragmatics. Since for *more than half* 'not all' is only pragmatically derived, it is relatively easy to cancel, but since for *most* 'not all' is compatible with its upper bounded lexical meaning, it is not easily cancelable. These findings attest once again that the upper bound is different for the two expressions. There is a rather strong pragmatic tendency to avoid seeing *more than half* as denoting with 'all', but it is only a pragmatic tendency.

Another possibility to explain the difference between *most* and *more than half* regarding the 100% value is to invoke Horn's Division of Pragmatic Labor, and reason that since the speaker used the lengthier/marked form for the same semantic meaning, the lengthier form is used for the values for which the more economical *most* tends not to be used (Papafragou & Schwarz to appear). Indeed, when we compare the rates of acceptance for the 100% value, we do see a large difference between *most* and *more than half*: There is a 500% difference between *more than half* and *most* here. Now, if this is right, there is no reason to believe that the length difference is only relevant for one value, and we should find such a difference consistently for all values, for it is always the case that *more than half* is lengthier than *most*. This is not the case, however. I have found differences in the rates of acceptance for very low and very high values for the two expressions, where *most* favors the higher values and is dispreferred for the lower values (see Figure 2). But first, these are not at all as dramatic as the difference between *most* and *more than half* concerning the 100% value. Second, there is no difference between the two expressions for 80% and 85%. If *most* is favored for these values, and it is (92.9% of the responses accepted these values for *most*), how come so is the lengthy *more than half* (acceptance rate 96.8%)? Why isn't the length difference relevant here?

Finally, Horn (2005) attempts to explain the difference in the acceptance of 51% and 100% values between *most* and *more than half* by reference to what the relevant issue is. With low majorities, he reasons, the question is whether a majority obtains or not. *More than half* is then more appropriate, because it makes the 'above half point' salient. We agree on that. For the 100% value, on the other hand, he assumes, it is the totality which is relevant, and hence *most* is barred from denoting it, because it (and only it) contrasts with *all*. First, as I have argued at length in Ariel (2004), it's a rare case that the totality is relevant in discourse when *most* is used. Second, as I have just argued, *more than half* too forms an opposition with *all*. Third, Horn's assumptions here predict that subjects' choice of 51% and 100% values should be similar for *most*. Both values are semantically viable, even though they are pragmatically dispreferred.

This prediction, however, is not borne out. As mentioned above, in the question where I tried to force subjects to accept a 51% value, a substantial majority went along and accepted it for *most* (81.3%). This rate is 8.7 times higher than the rate of acceptance for the 100% under similar conditions (9.4%). In other words, a pragmatic preference is violated 770% more in one case than in another. I would say instead that the high violation rate points to a pragmatic violation, whereas the marginal rate of violation points to a semantic violation.

In fact, it does not seem to me that subjects were considering a comparison between *most* and *more than half* in my questionnaire, as is implied by Horn's suggestion (recall that each subject saw only one of these expressions). On my account, the different acceptance rates between *most* and *more than half* are pragmatic for the low (51–75%) and for the very high majorities (90, 99%), because whereas *more than half* makes the half line an explicit reference point, *most* tends to be used for a noteworthy quantity (see again note 1 and Ariel 2004). The difference concerning 100%, on the other hand, is lexical (only *most* is lexically upper-bounded). This is why it is so much stronger (14.1 times larger). There is, however, nothing to push for differences concerning the high (but not very high) values (80, 85%), and hence, no difference is found. In other words, contra Horn's prediction, there is nothing close to a cross-the-board division of labor between *most* and *more than half*, based on their formal or content differences, except for when the 100% value is concerned (see Figure 2, and Ariel 2003, 2004 for actual percentages).

My conclusion is that subjects absolutely refuse to accept that speakers could have meant 100% values when *most* is used. Since no pragmatic explanation can account for this absolute finding, I conclude that it stems from the lexical meaning of *most*, which is (lower- and upper-) bounded. Given the findings in 2.2 and in 2.3 below, it seems that not only is it the case that pragmatics cannot be responsible for the upper bound placed on *most* (the conclusion I drew in Ariel 2004), semantics is actually the appropriate linguistic competence to account for it.

2.3 An argument from 'wise-guy' interpretations

In Ariel (2002), I argued against an 'at least' coded meaning for the numbers, based on what I term 'wise-guy' interpretations. 'Wise-guy' interpretations are interpretations an interlocutor can insist on despite the fact that they are contextually inappropriate. The argument is that the 'wise-guy' can insist on a contextually inappropriate meaning if it is lexically coded, but not if it is only pragmatically derived. In other words, coded meanings can, but pragmatic meanings cannot overrule contextual factors. The store manager in (10) is such a 'wise-guy':

(10) "A young couple went into the Allegro record store and offered to sell two CD's. The store manager offered the couple 40 sheqels. The guy, who looked like a Kibbutznik, said that in the store across the street he can get 50 sheqels. The manager of the store said that not on his life will he get such a sum. They took a bet . . . The guy . . . sold the CDs and got 55 sheqels for them. He took a receipt and went back to Allegro. Sorry, said the manager, you lost. I said you won't get 50 sheqels, and indeed, you did not get such a sum. I got more, explained the astonished Kibbutznik, but the sales woman laughed in his face" (A story in the magazine *Hair* 3.9.1990, originally Hebrew).

The store manager insists on a contextually inappropriate interpretation whereby *50* only denotes '50', when an 'at least' reading is contextually appropriate. The only reason she can get away with it, I argued, is that the circumbounded reading of the numbers is their coded meaning. The

'at least' interpretation is a pragmatic enrichment of that meaning. I contrasted (10) with a 'wise-guy' interpretation of a contextually inappropriate 'at least' reading, which is not successful. While the 'at least' interpretation can certainly be a legitimate contextual interpretation in some contexts (as in (10)), it is not entrenched (nor lexicalized) so as to allow interlocutors to insist on it in a context requiring a circumbounded reading:[11]

(11) ∼Income tax clerk: How much money did you make last year?
Taxpayer: $10,000.
Income tax clerk: Our information shows that you made $15,897!
Taxpayer: ??That's what I meant. I meant that I made at least $10,000, and possibly more.

The same argument applies to *most* ('at least most' vs. 'circumbounded most'). When we substitute *most* for *50* in (10) above, we get the same 'wise-guy' effect of an extremely uncooperative store manager, who can nonetheless get away with a contextually irrelevant interpretation, just because it is an unenriched conveyed meaning (based only on the circumbounded lexical meaning). The 'at least' meaning is only derived:

(12) ∼"A young couple went into the Allegro record store and offered to sell four CD's because they needed 100 sheqels to repair their CD player. The store manager offered the couple 40 sheqels. The guy, who looked like a Kibbutznik, said that in the store across the street he can get **most** of the repair money. The store manager said that not on his life will he get such a sum. They took a bet . . . The guy . . . sold the CDs and got 100 sheqels for them. He took a receipt and went back to Allegro. Sorry, said the manager, you lost. I said you won't get most of the repair money, and indeed, you did not get such a sum. I got more, explained the astonished Kibbutznik, but the sales woman laughed in his face".

Since the store manager can insist on the circumbounded reading of *most* even though context calls for an 'at least most' reading, the 'wise-guy' interpretation principle suggests that it must constitute its coded meaning. Under my account, the store manager refuses to enrich the circumbounded meaning with 'at least'. Note that again, insisting on an 'at least' meaning of *most* in a context requiring the circumbounded interpretation does not create a 'wise-guy' interpretation, but rather, plain deception:

(13) ∼Income tax clerk: In how many of the past ten years did you fail to file your tax return?
Tax payer: **Most** years.
Income tax clerk: Our information shows that you failed to file in all those years.
Tax payer: ??That's what I meant. At least most, and possibly all the years!

Since only the circumbounded meaning of *most* (but not the unilateral meaning) is a potential wise-guy interpretation, it must be its coded meaning.[12]

[11] Following Chafe (1994:xiii), I mark constructed examples with ∼.

[12] This assertion is based on the judgments of all 22 'Introduction to pragmatics (2002)' students. One of my referees does accept a wise-guy interpretation here, however.

A note is here in order. I have argued that only lexically coded meanings can be imposed when contextually inappropriate, but actually, the meaning imposed by the store manager in (10) & (12) seems to be 'exactly fifty/most'. What is the status of 'exactly n'? I maintain that the coded circumbounded meaning, when unmodified by pragmatic implicatures (scalar or others) is equivalent to the 'exactly' meaning for practical purposes (except that the 'exactly' aspect is still cancelable). While the circumbounded meaning is compatible with a higher scalar value (a higher number, or 'all' for *most*), it does not encode it, and addressees would have to consider additional entities outside the profiled set to get the 'at least' reading. Since they don't normally do that, they are left with an 'exactly n' (or 'exactly most') interpretation.

We next discuss potential difficulties for the circumbounded analysis of *most*, truth-compatibility with 'all' (section 3), and the differential behavior of *most* and the numbers (section 4).

3 The compatibility of *most* with 'all'

3.1 Truth-compatibility vs. lexical meaning

The main motivation behind the received semantic analysis of *most* as only lower bounded is that it straightforwardly accounts for the judgment that *most* is compatible with states of affairs in which 'all' is true. Even though 'possibly all' is the case in only 11/127 (8.7%) of the uses of *most* in my data see (see Ariel 2004), these examples are impeccable, and should therefore be accounted for.[13] My subjects too sometimes assigned *most* an 'at least most, possibly all' interpretation when the context was thus biased (see (19) and section 4), and some of them also saw *most* as compatible with 'all' ((8), (18)).

However, creating a gap between a lexical meaning and the meaning commonly conveyed by it, via a 'surplus' semantic analysis, is clearly an undesirable step theoretically. Even if this gap can cleverly be bridged over by a scalar implicature, a 'just that' semantics is to be preferred, other things being equal. Hence, if we can otherwise account for the intuition that *most* is (sometimes) compatible with 'all', the motivation behind the received view will be drastically reduced. This is what I am suggesting here. My account for *most*'s compatibility with 'all' is based on the assumption that it is not false (only misleading, in many circumstances) to select a subset ('most') for predication when a larger set ('all') is true. This is not at all special to *most*.

My line of argument here builds on Koenig (1991). As Koenig (1991:140) points out (regarding the numbers only), we should not confuse two logically independent questions: (1) the fact that "Scalar predicates are (at least sometimes) treated discursively as logically **compatible** with a higher value on the scale they evoke" (applied to *most*, this would mean that *most* is sometimes compatible with 'all'), and (2) "the theoretical claim that the **lexical meaning** of scalar predicates specifies only a lower bound on this scale" (emphases added) (applied here, this would mean that *most* means 'at least more than half, possibly all'). There is then a difference between expression X being compatible with a certain state of affairs, and expression X coding that state of affairs.[14] *Most* is certainly compatible with 'all' being the case (on some occasions),

[13] As corroborating evidence, consider the fact that especially children have been found to respond 'true' to statements containing *some*, which they know to actually be true of 'all' (e.g., *Some elephants have trunks*) (See Smith 1980, Noveck 2001, Papafragou & Musolino 2003). Note that since most experimental research has been conducted on *some*, rather than on *most*, and since the received view assumes a similar bilateral analysis for both expressions, I here use research on *some* as well.

[14] Smith's (1980:199) automatic conclusion re the meaning of *some* from verification tasks hinging on being **com-**

but these scalar effects do not necessitate the received lexical meaning of *most*. In fact, they are language-independent. If we accept the distinction between meaning and compatibility with states of affairs, we no longer have to stipulate as part of the coded meaning 'surplus' aspects of reality which are compatible with the use of the expression. *Most* can then commit the speaker to asserting something about 'most but less than all' relevant entities, even though its use is compatible with the predicate being true of 'all'.

Of course, all analyses distinguish between coded meanings which pertain to relevant states of affairs, and irrelevant states of affairs compatible with such meanings. The controversy here is really about what constitute lexically relevant states of affairs for *most*. The received view sees 'all' as pertinent to what's asserted about the reference set, whereas I suggest that discoursal usage shows that it isn't. On my analysis, 'all' and the complement of *most* are outside the discussion **lexically**, but this characterization does not preclude situations where *most* is truthfully used when 'all' is true, just because 'most' forms part of 'all', and there may be additional members outside the profiled set (i.e., in the complement) for which the predicate happens to hold. Parts are often (but not always) true when wholes are (see below).

Let's examine Koenig's arguments more closely. Koenig's thesis about scalar predicates seems to be the flip side of the Hirschberg (1991) coin. While she argues that nonconventional scales are like conventional Horn scales in terms of their implicatures, he argues that conventional scalar expressions should be analyzed like nonconventional ones in terms of lexical meanings. Recall that Hirschberg discusses examples with scalar implicatures in the absence of a conventional Horn scale, from which she concludes that scalar effects also occur for items not forming conventional Horn scales. Koenig relies on precisely such nonconventional cases to argue against the semantic analysis proposed for conventional Horn-based scalar predicates. Just like the ad hoc scales do not force us to assume a unilateral lexical meaning for the ad hoc scalar items (this would be a 'surplus' semantic analysis), so we should not impose a unilateral lexical meaning on items which do form part of a conventional Horn scale. Consider (14a). As Hirschberg argues, such examples can generate scalar implicatures (what is negated is the implicature 'only Catholics'), despite the fact that there is no conventional scale such as (14b) (see the examples in (28b-d):

(14) a. ∼CATHOLICS are not oppressed, ALL MINORITIES are oppressed (Koenig's example # 7).

b. <Minorities, Catholics>

Koenig relies on the fact that no lexical consequences follow from such examples (i.e., we would not suggest that Catholics means 'Catholics, and possibly other minorities') to argue that no lexical consequences need follow from similar examples involving conventional Horn scalar predicates either. Koenig, of course, only applies this argument to the numbers, but I don't see that the argument is restricted to the numbers. It equally applies to *most*.

The numbers are not the only linguistic expressions where truth-compatibility may be distinct from the speaker's coded meaning. Sevi (1994) argues that while the overwhelming majority of Hebrew *xuc me* ... 'except for ...' uses are such that the relevant predicate does not apply to

patible with a certain reality (where children had to indicate whether a statement such as *some elephants have trunks* was true or false) is typical: "children interpreted *some* as **meaning** *some and possibly all*" (emphases added). I believe that Papafragou & Schwarz (to appear) also take tests about truth-compatibility as attesting to meaning (see below).

the entity modified by the adverbial, this is merely a pragmatic inference, rather than a semantic entailment. Hence, it's not lexically specified for *xuc me* … A speaker using the Hebrew counterpart of 'all except y' asserts some proposition regarding the set minus that entity, regardless of whether the predicate is or is not true of it (the entity has to be exceptional in some sense, but not necessarily in that the predicate does not hold of it). This lexical meaning, then, does not preclude the possibility that in reality, the predicate does apply to the argument. Indeed, in (15) 'won here' also holds for the argument modified by the Hebrew 'except for' (indifference):

(15) Who won here, **except for** indifference? (Originally Hebrew, Kol Israel radio interviewer, 10.29.2003).

Having used *xuc me* …, the speaker indicates that it is not his goal to assert that 'indifference won', because he doesn't want the interviewee to discuss this "winner". As a topic, 'indifference' is excluded, because it is not included under the predication of 'won here', but as a fact 'indifference having won' is not ruled out.

In fact, this distinction between meaning and truth-compatibility is relevant for any linguistic expression. For example, it is not false to predicate something only of mother, when the reality is that the predicate actually holds of 'both parents, and the rest of the family'. Note the following (the three Israelis named were believed at the time to be alive, captives of the Hezbollah in Lebanon):[15]

(16) Benny Avraham, Adi Avitan, Omar Su'ad **Mother** is waiting at home (Originally Hebrew bumper sticker 1999).

Just like we are no longer forced to stipulate that *five* codes 'at least five', just because it is not false to say *five* when 'eight' is the case (see section 4), so too the fact that we can use *most* when 'all' is true should not force us to assume that the coded meaning of *most* covers 'all'. My formulation treats the complement of 'most' in the same way it treats 'father' when *mother* is used. Both are external to the (explicit) discussion. Both are lexically irrelevant.

Once we are willing to distinguish between the compatibility of expression X with certain states of affairs and X's meaning (provided this compatibility is either irrelevant or extralinguistically accounted for), it is hard to see what compelling evidence there is to viewing the lexical meaning of all scalars as unilateral. A 'just that' semantics should be preferred over a 'surplus' semantics.

3.2 Truth-compatibility as (partly) pragmatically determined

Thus far, I have taken for granted the received intuition, that *most* is consistent with 'all' (see Horn 2005). While this intuition is naturally accounted for on my proposal (because 'most' denotes a part within a whole, and what's true of some part, may in fact be true of the whole, even if the speaker did not refer to all set members), it seems that conversationalists do not actually interpret *most* as compatible with 'all' automatically. Rather, it depends on the context and on the addressee. Noveck (2001) finds that subjects vary on whether they judge sentences such as *Some elephants are mammals* as true or false. Papafragou & Musolino (2003), on the

[15]It is not surprising to learn that the children tested by Smith (1980), on the one hand did confirm that *some* … is true when actually 'all' is, but, on the other hand, they frequently added a reference to *all* in their responses.

other hand, find that adults overwhelmingly reject such statements. I suggest that this points to the pragmatic nature of the compatibility with 'all' of *some* (and equally, of *most*). Unlike semantic judgments, pragmatic judgments are expected to be variable (see also section 4).

Since I hypothesized a difference between the coded meaning of *most* and its truth-compatibility with 'all', a different type of questions was included in the questionnaire mentioned above, in order to investigate the nature of the compatibility of *most* with 'all'. (18) is a variation on Horn's (2005:18) (47a), quoted here as (17), about which he says that "it is clear that once the Dolphins won all their games . . . I won the bet":

(17) I'll bet you that the Dolphins will win **most** of their games this year.

In (18), subjects were not asked to decide what the speaker's possible intended meaning was per se. Rather, they were encouraged to presuppose that somebody is entitled to some prize for having made the correct guess (the question presupposes a winner), so that all they needed to decide was who was closer to the correct value, whose answer was more compatible with 'all'. Nonetheless, the majority of the subjects resisted my encouragement, and they resisted it equally for *80%* and for *most*. (18) does not only demonstrate the similarity between *most* and the numbers (80% in this case – see section 4), but what is more crucial to the point at hand, it shows that the compatibility of *most* with 'all', while not ruled out by the semantics of *most*, must be established via pragmatic reasoning. Contra the received view assumption, speakers are far from unanimous in confirming it:

(18) The catering company manager announced that if anyone would guess how many of the guests would prefer square plates, they would win a dinner set. Dana guessed that **most** of the guests would prefer square plates, Oren guessed that none of the guests would prefer square plates, and Iddo guessed that **80%** of the guests would prefer square plates.

Question: At the end of the event, it was found out that **all** the guests preferred square plates. Who is entitled to the promised prize?

Answers: A. Dana B. Oren C. Iddo D. Nobody

All answers but one made one and the same decision about Dana (*most*) and Iddo (*80%*). 8/24 (33.3%) selected both as winners, and 15/24 (62.5%) chose 'nobody'.[16] It is worth noting that contra Horn's intuitions regarding (17), almost twice as many subjects thought that *most* (just like 80%) is incompatible with 'all'. I had 4 truth-compatibility questions for *most* on the questionnaire, and 'all' acceptance varied between 5.9% and 83.3% (three of these four questions are cited in (8), (18), (19)). This variability points to the pragmatic nature of the part-whole inference here.

The results in (18) resemble those of (8), but here's a case where 'all' acceptance was contextually supported, and hence, accepted by most of the subjects (Knesset is the Israeli parliament):

[16]One of my referees comments that it's possible that the identical responses for 80% and *most* may be independent of each other. For instance, that 80% was rejected because it is different from 100%, but that *most* was rejected because it's not an informative enough alternative for a guessing game. I cannot rule out this possibility, but it is highly suspicious that 23/24 of my subjects made exactly the same decision about *most* and about 80% (in whatever direction). In other words, why should it be that exactly the same set of people who thought that guessing 80% does not entitle Iddo to the prize also think that *most* is an illegitimate guess, whereas precisely the set of people who thought that 80% entitles Iddo to the prize also thought that *most* is an appropriate guess?

(19) It is not necessary for all 120 Knesset members to be present for the Knesset to convene. The law requires that **most** Knesset members participate in the assembly discussion tomorrow. **They** will be asked to vote on a series of social laws.

Question: Who are the "they" who "will be asked to vote on a series of social laws"?
Answers: A. All the Knesset members who will participate in the assembly discussion tomorrow, that is, no less than 61 and up to 120 Knesset members, including 120 Knesset members.
Or:
B. All the Knesset members who will participate in the assembly discussion tomorrow, that is, no less than 61 and no more than 119 Knesset members.

The great majority of the respondents chose answer A (25/30, 83.3%), assigning *they* an 'at least most' reading. This is quite different from the previous rates of truth-compatibility with 'all' (31.8%, 33.3%).

Varying the context also dramatically influenced the 5 year-olds tested by Papafragou & Musolino (2003). Whereas in their first experiment the children overwhelmingly accepted *some* when 'all' was the case, in a second experiment they tended to reject *some* when 'all' was the case (this is the adult pattern). The authors explain the different responses by reference to the changed context they created in the second experiment. The second context, they argue, more readily invites scalar inferences. The reason is that in the second experiment only 'all' was relevant. I propose instead that what the changed context did was block part-whole inferences more readily. If only 'all' is relevant, then stating *some* when 'all' is true relies on a valid whole-to-part inference, but is pointless. In general, then, what are taken as circumstances favoring the generation of a scalar implicature, I mostly view as circumstances blocking inferences about the compatibility of parts with wholes. What is viewed as circumstances blocking scalar implicatures I view as circumstances favoring/not blocking inferences from wholes to parts (or upward compatibility). Thus interpreted, the recent interesting findings re the appropriateness of *some* when 'all' is true cannot be used to argue against the circumbounded view.

Much the same point applies to Papafragou and Schwarz' (to appear) attempt to justify a Neo-Gricean account for *most* over the analysis here proposed. In apparent contradiction to my findings (see 2.2 and see Ariel 2003, 2004), Papafragou and Schwarz find that many of their adult subjects accepted 100% as compatible with *most* – 56.7%. Although this acceptance rate is no different from chance in their experiment, it seems to be dramatically higher than the rate of acceptance for 100% among my subjects (6.25%).[17] It is unlikely that the difference in languages (Greek versus Hebrew) accounts for this difference. Rather, I believe that what Papafragou and Schwarz tested for is the **truth compatibility** of *most* with 'all'. Their questions are then comparable to the second set of questions on my questionnaire (exemplified in (8), (18) and (19) above), where the focus was on *most*'s compatibility with 'all', not on its possible extensions.

The analysis here proposed accepts that *most* may (but need not) be viewed as compatible with 'all' (see the relatively high rate of 'all' acceptance – 83.3% for the question quoted in (19)).

[17]Whereas on my questionnaire subjects could always choose a 'none of the above' answer, Papafragou and Schwarz' subjects could only choose between confirmations and disconfirmations. Hence, the difference is actually not quite as large as it looks.

As I have tried to emphasize, however, truth-compatibility with 'all' does not amount to **coding** 'all'. This is why I posed two different sets of questions to my subjects: some on its possible extensions and others on its truth compatibility with 'all'. And indeed, as we have seen, the results are remarkably different. In the first set of questions I aimed at getting at the meaning of *most* by asking about all the **(even remotely) possible values** that the speaker could have in mind while uttering a *most* utterance. In the second set of questions I asked whether a *most* utterance can be taken as compatible with a **reality** where 'all' is the case. Papafragou and Schwarz, on the other hand, asked subjects about the truth-compatibility of *most* with 'all' (they asked whether the character "did ok" when they performed 'all', having said that they would perform *most*). Under such circumstances, I claim, part-whole inferences are less blocked, and subjects reasoned that performing 'all' counts as performing *most*. A later questionnaire I administered more clearly underscores the distinction between the two types of questions. Among subjects asked about the meaning of the Hebrew counterpart of *The teacher already knows most of the students*, only the usual marginal percent (2/23, 8.7%) chose a unilateral meaning (defined as 51–100%). However, a majority (11/15, 73.3%) of the subjects asked about the truth of the proposition in case the teacher already knows all of the students confirmed *most*'s truth-compatibility with 'all' here. The gap between the responses on this very same proposition is huge: 8.4 times more truth-compatible with 'all' confirmations than unilateral meaning confirmations.

An additional piece of evidence for my claim that 'all' confirmations for *most* are mediated by contextual assumptions comes from examining the breakdown of the responses to 100% in the Papafragou and Schwarz experiment. It turns out that 50% of their subjects (5) virtually always confirmed it (14/15 trials), but the other 50% (5) always rejected it (15/15 trials – see their note 10). Noveck & Posada (2003) similarly found (in two experiments) that 5 subjects confirmed sentences such as *some elephants have trunks* virtually always, whereas 7 subjects consistently determined that they were false. Such individual consistent differences point to the role of pragmatics in the process.[18] All in all, the variability among subjects and across pragmatic contexts attests to the pragmatic rather than semantic basis for the truth compatibility of *most* with 'all'. Moreover, note that whereas in questions of truth compatibility both I and others have found a wide variation among subjects (e.g., Cf. Papafragou and Schwarz's truth-compatibility findings vs. mine, and the different results I got for different questions), I did not find such a variation for the questions on the possible intended meaning of *most*. On my original questionnaire, 29/32 subjects absolutely refused to confirm 'all' when *most* was used, even though sometimes, no other legitimate alternative was available.[19] The uniformity in responses to the meaning type of question vs. the variability in responses to the truth-compatibility type of question supports my claim that the questions test two different sorts of interpretations.

Now, it may seem that questionnaire data simply cannot decide between the received unilateral view and my circumbounded meaning proposal: When subjects refuse to accept an 'all' interpretation I account for it by reference to subjects' refusal to allow part-whole inferences, whereas the unilateral theories account for it by reference to the 'not all' default implicature, and when subjects are willing to accept an 'all' compatibility, I explain it as subjects allow-

[18]The alternative of assuming lexical idiolects seems less attractive.

[19]Only one subject was consistent in accepting the 100% value in the three possible meaning questions. One accepted it in 2/3 questions and another accepted it in 1/3 questions. Interestingly, however, the subject who accepted the 100% value for *most* in 3/3 questions also accepted 20%, 49% and 50% values, and for the most part did not confirm that *most* was truth-compatible with 'all' (in 3/4 questions). In fact, she only confirmed the compatibility of *most* with 'all' for the question with a strong bias towards an 'at least' reading of most (19).

ing for part-whole inferences, whereas the unilateral view explains it by reference to the lexical meaning with implicature cancellation. Is there then no way to decide between the competing proposals? I think there is, because I don't think that the received view account is sound. It actually comes with a very high cost to the very Gricean theory it is couched in, specifically, to the concept of conversational implicatures. Recall that implicatures are defined as (i) cancelable and (ii) nontruth-conditional.[20] In their attempts to account for the empirical data, received view proponents have compromised both of these characteristics. In order to account for the first set of questions, on possible meanings, they in effect assume that implicatures are not cancelable. When truth compatibility with 'all' is not confirmed they don't only assume that implicatures are not cancelable, but also, that they determine truth conditions.

First, regarding the first set of questions, probing all possible extensions of *most*, I don't see how the unilateral view can account for why subjects absolutely refused to accept an 'all' interpretation, especially when no other interpretation was available. Received view theories assume that implicatures are cancelled under circumstances which render them false. Why didn't the subjects simply cancel the scalar implicature? Recall that on my "meaning" questions, subjects were constantly encouraged to (also) select highly unlikely answers (see the instructions in (7) again). This should have prompted the subjects to cancel the scalar implicature, which would have resulted in comparable confirmation rates for 100% values for these questions as for the 'all'-compatibility questions. Why does Horn assume that the implicature is cancelled in the betting context (17), but not in these questions? In fact, the 'all'-compatibility "cancellation" cases were never close to absolute, even in cases where the scalar implicature has been contextually cancelled (e.g., (8), (9), (18), and the numerous "elephant" experiments). The experiments mentioned above even more clearly involve such circumstances. Surely, subjects must have been aware that **all** elephants are mammals/have trunks. They should have then reasoned that the addressor couldn't possibly intend the scalar implicature, and the statements should have therefore been considered true, at least by a majority of the subjects. As mentioned above, very often they weren't, however. In order to explain such judgments, received view proponents have to assume that implicatures are not cancelled, even under favorable circumstances,

Second, it's not at all clear how theorists who assume an implicated upper bound can account for the rejection of infelicitous *some* (or *most*) statements as false, even if the implicature is not cancelled. After all, implicatures are supposed not to determine truth conditions. Indeed, when we test the effect on truth conditions of an interpretation which is uncontroversially an implicature, we see that its falsity does **not** render the implicating assertion false. Thus, in a separate questionnaire, one set of subjects was asked whether the Hebrew counterpart of the following suggests that proportionately more women or more men wore evening clothes:

(20) **Most** of the women and **more than half** of the men wore evening clothes.

As expected, many subjects (47.1%) confirmed the implicature that *most* denotes a more noteworthy majority than *more than half* (only 2% thought that proportionately more men wore evening clothes). However, when a different set of subjects was asked whether (20) was true in case 70% of the women and 85% of the men wore evening clothes, only one of them (4.5%) said that it was false. The majority (68.2%) determined that the statement was true. In other words,

[20]Whereas Levinson (2000) is open to the possibility that implicatures affect the truth conditions of the proposition used to implicate them, Horn (2004) reiterates his commitment to the original Gricean position, except for special cases of reinterpretation.

false implicatures do not usually affect truth conditions. Why should the scalar implicatures be different then? Recall the differential truth evaluation for *more than half* and *most* in (9), where the scalar implicature for *more than half* did not affect truth conditions. It seems that on the received view scalar implicatures must be truth-conditional sometimes, for they do determine truth conditions (recall also that very often subjects find that *some* and *most* statements are false even though they know that 'all' is the case). Such assumptions cast doubt on the implicated status of the upper bound. If 'not all' is not cancelable, and if it determines truth conditions, it suspiciously resembles lexical meaning.

Note, in addition, that while received view proponents are quick to rely on the 'not all' pragmatic implicature to account for subjects' truth value judgments, they are equally quick to ignore the scalar implicature when they consider other semantic phenomena, such as the effect of negation (see 4.1) and the assumed upward monotonicity of *most*. For example, why isn't the negation of *most* taken as applying to its conveyed upper-bounded meaning, possibly denying 'all'? If the implicature is allowed to influence truth value judgments, then the received view too (and not just the circumbounded view – see 4.3) has to account for why the scalar implicatures seem **not** to affect other semantic processes. They can't have the cake of scalar implicature (invoke it for truth value judgments) and eat it too (eliminate it for negation). In conclusion, I am proposing that *most* only profiles a majority reference set as its lexical meaning. The predicate is asserted to be true of that reference set, and it is silent about the complement set. Contra the received view, its compatibility with states of affairs in which the predicate is true for 'all' is not lexically coded. It is in principle not ruled out semantically, but it must be extralinguistically established (via our context-sensitive assumptions about part-whole relationships).

4 *Most* and the numbers: A potential problem for the circumbounded analysis

Examples (10) and (12) show a similar interpretative pattern for the numbers and *most*, where the wise guy can insist on an upper bounded meaning, despite the fact that context calls for a lower-bounded-only interpretation. Similarly, the virtually identical interpretations of *most* and 80% in (18) suggest that we should perhaps not distinguish between *most* and the numbers. Now, according to Geurts (1998), the majority view for numbers is nowadays bilateral (but see Levinson 2000). Carston (1990, 1998) has argued for a 'just that' semantic analysis for the numbers, according to which *eight* means 'eight' (and not 'at least eight', see also Sadock 1984, Kadmon 1987, Récanati 1989, Koenig 1991, Geurts 1998, Ariel 2002). The appropriate conveyed meaning actually adopted ('at most eight', 'at least eight', 'exactly eight' or, I should add, 'about eight') results from a general process of adaptation of the coded meaning (via the Principle of Relevance) to create the ad hoc concept relevant for the specific context (see also Ariel 2002).[21] Horn (1992, 1996, 2003) too now believes that the pragmatic enrichment creating the bilateral meaning ('exactly eight') forms part of 'what is said', i.e., having a (referential, truth-conditional) semantic, status, unlike regular Generalized Conversational Implicatures. In other words, despite the fact that lower numbers are often compatible with states of affairs in which higher numbers are true, current analyses for the numbers are upper-bounded for the most part. Shouldn't the same analysis then be applied to the scalar quantifiers as well?

[21]Carston (1998), however, is undecided between a semantic meaning of 'exactly x' and 'x' for the numbers, but see again my discussion at the end of 2.3 as a possible explanation for the centrality of the 'exactly' reading, despite the general lexical meaning.

Despite the shift in their analysis of the cardinal numbers, Sadock (1984), Horn (1992, 1996, 2003), Geurts (1998), and Carston (p.c.) explicitly choose not to apply their bilateral semantic analysis of the numbers to other scalar predicates. The reason is that various differences have been pointed out between the numbers and scalar quantifiers. If I am correct, then, and *most* does have a circumbounded rather than unilateral lexical meaning, it would seem that it should pattern with the numbers. Indeed, Horn (2005) uses differences between *most* and the numbers to argue against my proposal. In order to justify my analysis I must therefore either show that *most* does behave just like the numbers, or else, that the differences between them are orthogonal to the question of unilaterality vs. circumboundedness. These are the goals of section 4.

I will propose that the differences between *most* and the numbers are, first, far from absolute, which they should have been if they were semantic. Second, they are orthogonal to the circumboundedness question. I will argue that the differential patterns noted in the literature are derivative from a number of differences between the numbers and *most*, which are quite irrelevant to the question of lexical upper-boundedness. In fact, as we shall see below, once we neutralize these differences, *most* and the numbers do pattern similarly. In other words, *most* may manifest a "number, bilateral pattern" (as we already saw in 2.3 and in 3), and the numbers may manifest a "*most*, unilateral pattern". If that is the case, then the fact that the numbers and *most* differ in some contexts is no hindrance to viewing *most* too as upper bounded.

I would actually like to try and take my conclusions even further than that. I would like to propose that the set of behaviors assumed to define 'the unilateral pattern', e.g., participation in downward entailments, upward compatibility, which allows for the smooth shifting to higher values and for 'at least' readings, noncoccurrence with certain quantifiers, etc. consists of a number of independent propensities, each in response to some characteristic. While these properties often cluster together, so that some expressions in some of their uses seem to fit the description perfectly, they often enough do not converge on creating a unified "unilateral" picture. Specifically, I will argue that *most* does not manifest an absolute "unilateral" pattern, and that the numbers do not manifest a perfect "bilateral" pattern. Rather, depending on the appropriate ad hoc interpretation they receive in context and the properties associated with that interpretation, *most* and the numbers demonstrate either a "unilateral" or a "bilateral" pattern.

Section 4.1 will present the received view picture, according to which *most*, but not the numbers, seems to display the "unilateral" pattern. In section 4.2 I will demonstrate that *most* does not always go the "unilateral" way, and that similarly, the numbers do not uniformly follow the "bilateral" pattern. I will then try to account for the differential patterns of both types of expressions by reference to three parameters: punctuality, interactional distinctness from higher values, and the enablement of part-whole inferences (4.3). It is the value on these parameters which determines whether a given expression will manifest some "unilateral" or "bilateral" pattern of behavior. If so, the observed differences between *most* and the numbers do not constitute a valid basis for rejecting my analysis of *most* as circumbounded.

4.1 A unilateral pattern for *most* but not for the numbers

The examples in 4.1 are all cases where *most* is interpreted differently from the numbers, arguably justifying a unilateral analysis only for *most*. First, note the following from Geurts (1998:106):

(21) a. ∼At least/at most/half of/exactly **two hundred** ships.

b. ∼?At least/at most/half of/exactly **most** of the ships.

It is certainly true that the scalars are not as free as the numbers to combine with the modifiers in (21). Indeed, a search of BNC and CoBuild showed a meager number of *at least mosts*, in most of which *at least* did not have scope over *most* alone. I found no *at most most*, nor *exactly most*. Second, Sadock (1984) argues that the cardinal scale, but not the quantifier one, is easily reversible. Indeed, all 26 *most if not* occurrences in the BNC were followed by *all* – e.g., (23) (rather than by *some*). Here, however, is an example with a reversed scale for a numeral:

(22) After **two** hours, if not sooner (Collins CoBuild).

Next, we come to more pertinent cases, where the difference between the numbers and *most* (and other scalar quantifiers) seems to directly motivate a unilateral analysis for *most*. First, the ability to shift smoothly from *most* to *all* in the same utterance, without sounding contradictory has been cited in support of a unilateral semantic analysis, because it shows *most*'s compatibility with 'all':

(23) Right I'm gonna ask the director, who I think is going to pick up **most if not all** of your points, <BNC: J43 182>

Second, *most* is predicted (by Fred Landman, p.c.) to pattern with *at least n* expressions as a discourse antecedent for *they*. The numbers, on the other hand, can only be interpreted as 'exactly n' when they serve as discourse antecedents (Kadmon 1987). Consider the following examples, assuming that that the facts are that all the Hondas (say, 20) were defective:

(24) a. ∼**At least 11** Hondas were defective. They took **them** out of the shop.

b. ∼**Most** Hondas were defective. They took **them** out of the shop.

c. ∼**11** Hondas were defective. They took **them** out of the shop.

Kadmon predicts that (24a) is acceptable and true with the interpretation that 'all the Hondas were taken out of the shop'. (24c), on the other hand, is infelicitous, because the antecedent specifies 'exactly 11', and the known facts are that '20 Hondas are defective'. Landman proposes that (24b) patterns with (24a), rather than with (24c), arguing that since *most* is compatible with 'all', if all the Hondas were defective, then all of them were denoted by *most*, and therefore 'all' is denoted by *them*.

(19) above is a question from my *most* questionnaire, showing that most of my subjects interpreted a discourse anaphoric *they* as referring to 'possibly all', when the antecedent was *most*. Indeed, 31/36 (86.1%), similarly chose the same answer for *more than half*. It therefore seems that Landman's prediction for a lower-bounded-only pattern for *most* is confirmed by my subjects.

Last, behavior under negation has also been used to argue for the differential behavior of the scalar quantifiers and the numerals. The unilateral received view seems to have a straightforward explanation for the observation that negating scalar expressions such as *most* is normally taken as negating only their lower bound. If *most* covers any quantity above 50%, 100% included, then negating it can only be compatible with less than 51%. Indeed, *not most* in the following is probably interpreted as 'sometimes' i.e., as less than the lower bound (51%), and not as 'always', i.e., as more than the upper bound (99%):

(25) A: Uh, well that's true. But I get my hair cut about what every six weeks too.
B: Yeah, and it looks bad most of the time too. Well **not most** of the time. (LSAC).[22]

Since 100% is assumed to be a possible denotation for *most*, the received view can also straightforwardly account for the observation (by Horn 1996) that while the numbers do not allow confirmation of a lower value (by an initial *yes*) if the reality is that a higher value is the case, the scalar quantifiers do (see also the results reported on in Papafragou & Musolino 2003). Here are Horn's examples in this connection (his examples 22, 22′), and the reader can substitute *most* for *many*:

(26) a. ∼A: Do you have **two** children?
B1: **No**, three.
B2: ?**Yes**, (in fact) three.

b. ∼A: Are **many** of your friends linguists?
B1: ?**No**, all of them.
B2: **Yes**, (in fact) all of them.

Note that in both cases B corrects A's lower value (*two*, *many*) to a higher value (*three*, *all*). The difference is that the number correction takes an initial *no*, whereas the quantifier correction takes an initial *yes*. Presumably, this is because '*three*' is not included in the denotation of *two*, but '*all*' is included in the denotation of *many*. The same should apply to *most*. In sum, it seems that the numbers and the scalar quantifiers manifest different interpretative patterns. The numbers go the "bilateral" way, the quantifiers go the "unilateral" way. Such findings seem to pose a problem for my circumbounded analysis of *most*.

4.2 Inconsistent "unilateral"/"bilateral" behaviors

We now consider a different set of examples, ones where *most* patterns as a bilateral expression, and the numbers pattern as unilateral expressions. The findings demonstrate that the differences between *most* and the numbers are not as consistent as they are presented in the literature. While the distributional pattern identified by Geurts (1998) (see (21) above) is on the whole supported by the data I examined, I did find two *almost most*s on the web (as well as many *almost a majority*), a few *at least mosts* (see again (5)), and 4 *roughly mosts*. And here's a constructed example where I think that *exactly* would be appropriate:

(27) ∼A: It sounds like your favorite authors are Castel-Bloom and Shabtai. Have you read all of their books?
B: I've read 7 by Castel-Bloom. I think that's most of her books. But I've only read two by Shabtai. I doubt that's most of his books.
A: That's **exactly most**. He only wrote three books.

When the total set is three books, *most* necessarily refers to one specific value, namely 'two', under my analysis. Hence the ability to modify it with *exactly*.[23]

[22] All the examples from LSAC come from research conducted together with John Du Bois.

[23] While audiences exposed to this example seemed to accept my judgment, Laurence Horn (p.c.) and one of my referees find it an impossible combination. As we shall see later, even if they are right, this has no bearing on the upper bound issue.

Next, recall Sadock's (1984) point about the non reversibility of the quantifier scale, as opposed to the numeral scale, which is reversible. First, note that scalar comparisons tend to go from lower to higher values not just for *most*, but for the numbers as well: All 4 *two if not* were followed by higher values in the BNC. The 3 numeral + *if not* combinations in LSAC were also all followed by higher values. The 2 cases where a numeral + *if not* was followed by a lower value in CoBuild referred to time (see (22)). The other 2 cases specified a higher value. Thus, in general, all scales are not often reversed. Moreover, the following set of examples shows how the quantifier scale can in fact be reversed. Koenig (1991), justifying a bilateral analysis for the numbers, argues that measure phrases show context-dependency as to what the direction of the scale is. The following examples have been constructed on the basis of similar examples from Koenig with numbers (Koenig stars the counterparts of examples (b) and (c) with numbers). As can be seen, a similar pattern is exhibited by the scalar quantifiers:

(28) a. ∼You can buy this book with **all**/**most** of the money you have there, in fact with **most**/**some** of your money.

b. ∼??You must pay for this book with **all**/**most** of the money you have there, in fact with **most**/**some** of your money.

c. ∼??You can buy this book with **most**/**some** of the money you have there, in fact with **all**/**most** of your money.

d. ∼You must pay for this book with **some**/**most** of the money you have there, in fact with **most**/**all** of your money.

Thus, it may just be the case that there are less uses for "reversed" quantifier scales. But they are not irreversible in principle.

Next, I quote examples where the pattern adduced in support of the unilateral meaning of *most* is equally attested for the numbers, as well as for nonconventional scalar items:

(29) a. Well yeah but you see that the trouble is they've been now **two if not three** pilot phases. <BNC: H5E 929>

b. her services if not **in regular demand** are no doubt **in demand**.
<LLC: 12 4b 3 6870 1 1 a 11 2>

c. Unfortunately for such critics it has been found that acupuncture works **equally well, if not more effectively**, on animals. <BNC: CB9 1459>

d. PHIL: . . . And they're **very close together**,
. . . in fact . . . they're in a v- . . . **joined uniform state**. <SBC: 027>[24]

It's quite clear that upward compatibility, enabling the noncontradictory shift from *most* to *all* is not unique by any means. (29a) shows it for a number, and (29b)–(29d) are examples where a noncontradicting scalar upgrade is available for predicates that do not at all form a conventional Horn scale. The scalar quantifiers do not pattern differently from the numbers, then, nor for that matter from nonconventional scalar predicates.

[24]Impressionistically, however, it seems that the numbers and nonconventional scalar predicates more often than the scalar quantifiers are modified by *at least* when followed by an *if not*. This stems from the range/punctuality difference, however (see 4.3).

A central argument of Koenig (1991) for preferring a bilateral analysis for the numbers is that their scalar effects are not stable. This undermines the usefulness of the conventional scale as a **linguistic** tool, a necessary feature of the received view. The examples below demonstrate that the same is true for *most*. Thus, just as Koenig notes that downward entailments, the basis for a Horn Scale, are not always applicable to the numbers, they are not always applicable to the scalar quantifiers. Just like (30a) does not entail (30b), so (31a) does not entail (31b) (both receive a collective reading):

(30) a. Usually, **four** men carried a corpse; (Collins CoBuild)
b. Usually, **three** men carried a corpse.

(31) a. PATTY: . . . that was the last time they were **a=ll** together. <SBC: 023>
b. That was the last time **most**/**some** of them were together.

Koenig further notes that downward entailments are not guaranteed even when the numbers are given distributive readings as in:[25]

(32) JIM: . . . if we had [. . .] **ten** accounts,
FRED: [Okay].
JIM: . . . we would charge (H) . . . five-hundred fifty dollars on ac- on an account,
<SBC: 014>

which does not entail that 'If we had nine accounts we would charge . . . '. The same is true for *most*. ∼*If we had most accounts, we would charge* . . . does not entail 'If we had some accounts, we would charge . . . '.

Next, Koenig discusses examples similar to (33), in order to show that number measure phrases too are not downward entailing:

(33) MELISSA: they live **three** blocks away, <SBC: 019>

Obviously, (33) does not entail that 'they live two blocks away'. Similarly, *all the time* in (34) does not entail 'most of the time':

(34) a: let me give you [@m] five hundred pounds or something
A: yes
a: and instead of you ringing me up **all the time**. <LLC: 22a1521035012a20>.

Since scales depend on a downward entailment relationship, and since these entailments are not always applicable, scalar effects cannot be lexically/automatically determined. This is true for both the numbers and the scalar quantifiers, as we already saw in (18) above.

Finally, in arguing for a 'set of exactly n' analysis for the numbers, Kadmon (2001:69) notes another nonstable scalar effect. Numbers can receive an 'at least' reading only in argument positions. Predicative positions are restricted to the circumbounded interpretation. She notes that in an example such as (35), *three* cannot be interpreted as 'at least three', so that the proposition is false if there were four cats:

[25] See Chierchia (2004) for a structural explanation for these instabilities (by reference to *any*-licensing contexts). The crucial point for my argument, however, is the similar patterning of *most* and the numbers. I assume that the same explanation applied to the numbers can apply to *most* as well.

(35) Why, they were **three** cats! (Lewis Carrol, *The three cats.* A story excerpted from a letter by Carrol to some of his child friends)

The same is true for *most*. Note that according to Saddam Hussein, (36) must be false, given that he was elected president with a hundred percent of the votes (as reported on Kol Israel radio, 10.18.2002):

(36) ∼The votes for Saddam Hussein were **most** of the votes cast in the election.

Thus, *most* too shows an asymmetry in receiving lower-bounded-only readings.

Let us now re-examine Landman's (p.c.) proposal that *most* can naturally serve as a discourse antecedent for a *they* interpreted as 'at least most'. We saw that this was the case in the questionnaire question cited as (19) above, but note that quite similar results were obtained when I asked about *61* in the same question:

(37) It is not necessary for all 120 Knesset members to be present for the Knesset to convene. The law requires that **61** members participate in the assembly discussion tomorrow. **They** will be asked to vote on a series of social laws.

Question: Who are the "they" who "will be asked to vote on a series of social laws"?
Answers: **A**. All the Knesset members who will participate in the assembly discussion tomorrow, that is, no less than 61 and up to 120 Knesset members, including 120 Knesset members.
B. All the Knesset members who will participate in the assembly discussion tomorrow, that is, no less and no more than 61 Knesset members.

Recall that a large majority interpreted *most* as 'possibly all' in the counterpart question. Similarly, 17/19 (89.5%) chose an 'at least 61' interpretation for the pronoun in the *61* case too. In fact, there were more subjects (16.7%) who insisted that the *most* anaphoric *they* only refers to an upper-bounded 'most but not all', than on an upper-bounded 'exactly 61' answer for the *61* question (2/19, 10.5%). A comparison between *most* and *61* as antecedents for *they* then shows that they pattern quite similarly ("unilaterally"), the 'at least' reading being preferred for both in this case. Similarly, recall that Horn (2005) predicts that whoever bets *most* wins the bet if 'all' is true (see again (17)). For a counterpart number, however, he is not sure whether the person betting on a specific number wins when a higher number turns out to be the case. In fact, I think that he should predict that once the bilateral number is incorrect the better should lose. In any case, as we saw, *most* and 80% patterned almost identically in the very similar guessing game question (see (18) above).

However, in the questionnaire reported on above I actually created two types of contexts where *most* or a number were later referred to by *they*. In both, subjects were told that reality is such that the predicate of the antecedent clause is true for 'all' (for *most*) or a for higher number (for the number antecedent). But only in one type of context (19) were the subjects willing to say that *most*'s conveyed meaning was 'at least most'. Hence, so was the anaphor. In the other type of context, subjects were not ready to assume that the speaker intended them to interpret *most* as conveying 'possibly all', despite the fact that 'all' was true in reality. Rather, they chose to see a gap between reality and the explicit utterance, which they interpreted according to its lexical,

unenriched circumbounded meaning. Hence, so was the anaphor interpreted as well. This is clearly contra Landman's claim. If *most* can denote 'all' and we know that 'all' is the case, the pronoun should have referred to 'all'. But it didn't in most cases. Similar questions with a number antecedent produced similar results (the reader is referred to Ariel 2003 for a more detailed discussion of the questionnaire results). What this means is that when subjects had to interpret *they* on the basis of the linguistic meaning of *most* or a number, they tended to go for a circumbounded interpretation. In other words, given the same contextual assumptions, *most* and the numbers patterned in the same, "bilateral" way.

Finally, I would like to show that the assumption that negating *most* always amounts to denying only its lower (51%) boundary cannot be maintained. First, a search for *not* + 0–3 words + *two*/*hundred* (I picked one small and one larger number) in LSAC revealed that for the numbers too negation is mostly interpreted as 'less than the specified number' (23 cases), rather than as 'more than the specified number' (3 cases), a 7.66 gap.[26] Next, confirming a higher number does not always require an initial *no* (this is then a "unilateral pattern" for a number). In the following, it seems that *30* patterns with the scalar quantifiers rather than with the numbers. Compare (26a) with (38), where the number (*30*) patterns with the scalar quantifiers, prompting an initial *yes*, rather than *no*:

(38) ∼A: Do you have $**30**?
B1: ?**No**, $**32**.
B2: **Yes**, $**32**.

The same seems to be true in the following cases:

(39) a. MONTOYA: (H) Italy for example,
ha=s . . . a voter . . . turnout,
. . . of **ninety** percent. <SBC: 012>
∼B1: Yes, **ninety three** percent.
∼B2: ?No, **ninety three** percent.

b. MONTOYA: There were **three hundred thousand** people.
. . . at that march in
nineteen-sixty-three. <SBC: 012>
B1: Yes, three hundred and ten thousand people.
B2: ?No, three hundred and ten thousand people.

In fact, versions similar to B2's response in (26a) have always been considered acceptable in the literature, when considered in the "social security" context (where it is assumed that one gets government support if one has at least two children). And compare (26b) with (40), discussing the possible extinction of the California Condor:

(40) (Imaginary Conversation in 1987, when there were only 32 California Condors in existence).
∼A: Are **most** of the California Condors infertile?
B: (Sadly) **No**, **all** of them are.

[26]The count for *a hundred per cent*, was not included. Of course, all such cases were interpreted as 'less than'.

In (41a) the speaker corrects himself from *most* to *every*. Similarly in (41b). Note that the corrections are prefaced by the "bilateral" *no*, rather than by the "unilateral" *in fact*. (41c), on the other hand, shows a "unilateral" *yes* response despite the denial of the lower (and not upper) bound on the scalar *beautiful*:

(41) a. In my thirty years of ??,
we have lost 1200 football games,
600 basketball games,
most of our –
No, **EVERY** track meet. ("The Ellen show", 8.22.2003).

b. R.G: How are decisions made, according to **(the) majority**?
O.L: **No**, **never**.
R.G: So who decides?
O.L: We **ALL** do (Originally Hebrew, University committee meeting, 9.1.2004).

c. Emma: e-that Pat isn't she a doll?
Margy: Yeh isn't she pretty
Emma: Oh: she's a **beautiful** girl.
Margy: **Yeh** I think she's a **pretty** girl
(Heritage 2002:ex. 24, transcription simplified).

(41) then show that contra current assumptions, initial *no* can be appropriate for a *most* to *all* correction (an upper boundary denial), and an initial *yes* may be appropriate for a *beautiful* (a strong scalar term) to *pretty* (a weaker scalar term) correction (a lower boundary denial).

All in all, the numbers sometimes manifest the "unilateral pattern" ((26a) sometimes, (29a), (37), (38), (39)), and the scalar quantifiers sometimes manifest the "bilateral pattern" ((27), (28), (31), (34), (36), (40), (41a,b)). The differences between them cannot therefore be absolute. Now, contrast the nonstable judgments in (26) with the following, where judgments concerning the initial *no* are not easily manipulated:

(42) ∼A: **Most** condors are infertile.

B1: ??**No**, you're wrong. **80%**/**99%** of them are.

B2: **No**, you're wrong. **All** of them are.

Since 80%/99% fall within the range covered by *most*, B1's *no*, *you're wrong* creates a contradiction (unless interpreted metalinguistically). It is not, however, necessary to interpret B2's *no*, *you're wrong* metalinguistically in order for it to be an acceptable response. The (nonmetalinguistic) judgments in (42) are stable, attesting to the semantic nature of the problem in B1's utterance. This is not the case for the previous examples we discussed in 4.2.

Finally, note that even the various scalar quantifiers don't always pattern in the same "unilateral" manner. *Half*, for example, patterns with the numbers regarding the cooccurrence restrictions noted in (21), rather than with the scalar quantifiers:

(43) a. **Exactly half** of my life has been here. (LSAC)

b. I think we need to get everybody back together for a **at least half** an hour. (LSAC)

In fact, it's even possible that *some* and *most* do not manifest exactly the same distributional restrictions either. I couldn't find any *at least most* cases in any of the corpora searched except for the web, but I did find such *some* combinations in LSAC (11 cases, but note that *some* is by far more frequent than *most*). Note also that substituting *some* for *many* in (26b) improves B1's response dramatically:

(44) ∼A: Are **some** of your friends linguists?
B1: **No**, all of them.

We conclude that it's not the case that *most* is invariably interpreted unilaterally. Similarly, it's not the case that the numbers are invariably interpreted "bilaterally". In addition, we noted differences between the scalar quantifiers themselves (*half* vs. *most*, *some* vs. *many*/*most*). In 4.3 I will venture an initial proposal regarding the differences between *most* and the numbers. I will argue that they follow naturally from prototypical, rather than absolute differences between the numbers and the scalar quantifiers. Crucially, these differences are orthogonal to the question of upper bound.

4.3 Deconstructing the "unilateral" pattern

The received view is right about *most* and the numbers manifesting different interpretative patterns (4.1), but I claim that these are only statistical tendencies: In 4.2 we have reviewed cases where *most* patterns according to the "bilateral pattern", and where the numbers pattern according to the "unilateral pattern". In addition, while both *some* and *most* often pattern in a similar ("unilateral") way, they do not always pattern uniformly. I would like to propose below that the so-called unilateral pattern actually consists of a number of patterns, which are in principle independent of each other. Crucially, they derive from factors which are irrelevant to the presence/absence of an upper bound: (Non)punctuality, degree of interactional distinctness and (non)enablement of part-whole inferences.

I will argue that what is termed a bilateral behavior comes about when the expression is interpreted punctually and/or as interactionally different from higher values not denoted by it, and/or when part-whole inferences are blocked. What is considered a unilateral behavior comes about when the denotation is perceived to cover a wide range, and/or not very distinct from higher values, and/or when part-whole inferences are encouraged. Statistically, numbers frequently meet both former conditions. At least, they are punctual and distinct from higher values. This is why they are considered "bilateral". *Most,* on the other hand, tends to meet the latter conditions (it is nonpunctual, interactionally not so distinct from the higher 'all' value, and perhaps enables part-whole inferences more often). This is why it is considered unilateral. My argument is, first, that the interpretative pattern results from these parameters directly, rather than from the fact that some expression is a number, and therefore bilateral, and another is a quantifier, and therefore unilateral. My second and main point is that what is taken as the unilateral pattern does not actually entail lack of upper bound for the expression. The differences below are orthogonal to the upper bound issue.

We start with (non)punctuality. Clearly, scalar quantifiers such as *most* denote a wide range, while the numbers' meanings are punctual. Indeed, in Ariel (2002), I presented a statistics based on two SBC conversations that 84.5% of the numbers are interpreted as 'exactly n'. Only 15.5% receive an 'about n' reading. I propose that this difference accounts for why the scalars are not

so much in need of modifiers such as *at least*, which create a range out of a punctual value. Thus, the low frequency of the combinations in (21b) is due to the fact that the numbers are punctual, whereas *most* covers a wide range. Note that *half* too is punctual. If I am right, it should therefore pattern with the numbers rather than with the scalar quantifiers with respect to cooccurrence with *at least* and *exactly*. Indeed it does (see (43) again). The punctual *half of* is also inappropriate for a nonpunctual quantity such as 'most'. Papafragou (2003) similarly finds a difference between *half* and aspectual verbs, such as *start*, which are vaguer in terms of their boundaries in triggering upper-bounded interpretations, and argues for a "discrete/nondiscrete asymmetry". In fact, as we have seen, once *most* receives a punctual interpretation (in (27)), it too can be modified by *exactly*. Be that as it may, I fail to see the connection between being wide range and being only lower-bounded. A wide range expression may very well be upper-bounded too. Whereas *at least*/*more than half* are wide-range lower-bounded-only expressions, *between twenty and a hundred* (LSAC) is wide-range, but upper bounded (see Keenan 1996), as are *a minority*, and *at most x*. Thus, whether or not *most* carries a lexical upper bound is quite orthogonal to the statistical tendencies noted by Geurts (1998). These reflect the fact that numbers tend to be interpreted punctually, and most of the scalar quantifiers (but less so *half*) tend to be interpreted as covering a wide range.[27]

Another difference between *most* and the numbers is that any number has an infinite number of higher values. *Most* does not. First, objectively speaking, the difference between 99.99% (the highest value covered by *most* under my analysis) and 100% is strikingly smaller than the difference between any number, as high as it may be, and other higher values not coded by that number. Second, while the difference between *most* and *all*, despite its small objective size, has been taken to be of utmost importance in the literature, interactionally, speakers and addressees do not necessarily assign the advantage of 100% over 99% such an important role (see Ariel 2004). Most probably because we have very low expectations to be making universal claims, the difference between 'most' and 'all' is not usually so crucial interactionally. Either type of generalization is seen as strong evidence/justification for some conclusion/course of action (see (1) again). In other words, I claim that *most* is not interactionally very distinct from *all*, because in most contexts (see Ariel 2004), the difference between 'most' and 'all' is not relevant, in that 'all' does not carry significantly different contextual implications that 'most' doesn't, to use Sperber and Wilson's (1986/1995) terminology. In addition, while a universal generalization is in some sense stronger, it actually brings with it a great vulnerability, which drastically weakens it. One counter-example is sufficient to render the universal proposition false. It is much harder to falsify a *most* claim, especially since in natural conversations, the size of the whole set is quite often not obvious to the interlocutors (see (1), (5)). In other words, the slight advantage of *all* over *most* in strength is offset by a large disadvantage in refutability. The following example testifies to this:

(45) A: Why do you **always** think you're right?

B: Because I'm RIGHT **most** of the time
(Beetle Bailey, *Int'l Herald Tribune*, 10.17.2003).

Note that B accepts A's proposition that he 'always thinks he's right', but he doesn't support it with a universal claim. A *most* claim is strong enough. Justifications by *most* are often not

[27] Of course, punctual values too, even if modified by exactly, have some 'slack', to use Lasersohn's (1999) term.

interactionally very different from justifications based on *all*. If I am right, then *some* and *most* should differ on this point, because unlike *most* and *all*, the (objective) difference between *some* and *all* is significant. A *some* generalization plays a different (and weaker) interactional role from that of *most* (and *all*), no doubt because *some* doesn't even have to denote a majority. I therefore expect *some* to sometimes pattern with the numbers and not with *many*/*most*. Indeed, we saw above that it was not so difficult to find *at least some* examples (but since *some* too covers a wide range, it's not surprising that there were no cases of *exactly some* in LSAC). Also, an initial *no* when confirming 'all', I claimed, was more natural for negating *some* than *many* and *most* (see (26b) vs. (44)). In fact, the difference between *some* and *most* seems to be more significant interactionally than that between *most* and *all*: 4/14 (28.6%) of the corrections of *some* to *most* were explicitly marked as a correction to a different alternative, but this was so for only 1/22 (4.5%) of the corrections from *most* to *all* in LSAC. For *most*/*all* alternations, the speaker seemed to merely be wavering between the two options (see 6.1 in Ariel 2004).

The result of the differences in punctuality and interactional distinctness from higher values between most uses of the numbers and *most* is that the numbers tend to contribute towards a proposition which is more specific and more easily distinct from another asserting a higher number, but under most circumstances this is not the case for *most*. Denying it is then expected not to be prefaced by an explicit *no*. If this is so, we can understand why researchers were led to believe that the difference between the numbers and *most* concerns the upper bound. Positing an upper bound only for the numbers seems to explain the different pattern of interpretation for *most* and the numbers under negation, as well as the differential interpretation they seem to receive as discourse antecedents. This, however, is problematic in that it would predict an absolute difference, which we don't find.

To see the significance of (non)explicitly stated distinct alternatives, we can examine the behavior of numbers and *most* under negation. I claim that the degree to which some value is interactionally distinct from another, higher one which a responder is proposing, interacts with the role of negation to produce the interpretative patterns observed in the literature. As we have seen for the numbers in 4.2, normally, negation is pragmatically interpreted as suggesting that a weaker concept is the case. Indeed, based on a variety of psycholinguistic experiments, Giora et al. (2004) and Giora et al. (2005) argue that negation is often pragmatically used as a hedge. The negated element receives a mitigated interpretation of 'less than' (note the ambiguity of *less* as 'lower in quantity' and as 'lacking', as in *merciless*). For *most*, less than 'most' means less than 51%, and not 100%, which is more than 99%. Horn might counter that negation seems to be a mitigator just because the negated elements here are scalar, and only have lower boundaries.[28] But this is equally true for nonscalar terms. *A fork*, for example, is obviously a circumbounded concept. Still, one does not normally deny *a fork* in order to affirm 'more than a fork':

(46) ALINA: and I did**n't** need **a fork** <SBC: 006>

We routinely interpret *not a fork* as 'less than a fork', say, 'no fork', and not as 'more than a fork', say, 'a fork and a knife'.

However, despite the fact that statistically, negation tends to be interpreted as applying to the lower bound of all concepts, there is an intuition about a difference between the numbers and the scalar quantifiers (see again Horn's examples in (26)). I suggest that once we take into consideration the examples in (38), (39), (40), (41), (42), (44), where the pattern is reversed for

[28] See, however, the discussion in 3.2.

both *most* and the numbers, it becomes clear that something else must be at work here. The generalization that emerges from all the examples is that the decision between an initial *yes* or *no* depends on the importance attributed to the difference between the two values in the given context. Large differences tend to be prefaced by *no*, small/insignificant differences tend to be prefaced by *yes*. As already mentioned above, since substituting *some* for *many* in (26b) improves it, it corroborates my claim that what matters is that there be a relevant difference between the answer and the original alternative suggested in the question. The following surprising denial attests that indeed, *no*'s have more to do with interactionally significant differences than with semantic denials:

(47) A.S: Do you have roasted **almonds**?
Salesman: **No**.
A.S: And what are these, aren't these almonds (pointing to roasted almonds)?
Salesman: These are **halved almonds** (Originally Hebrew, 3.10.2004).

In this case, the salesman thought that whole and halved almonds constitute significantly different alternatives.

What the answers in (26), (38), (39)–(42), (44), (47) show is that the decision to answer positively or negatively does not (directly) hinge on the number-quantifier contrast. Rather, *yes* and *no* seem to mark different stance alignments (to use John Du Bois' term, p.c.) between speakers: *Yes* marks agreement, *no* marks disagreement. These stances depend of course on the objective content conveyed by the interlocutors. A higher degree of agreement on content tends to trigger *yes*, and a low degree of agreement tends to trigger *no*. But what count as large vs. small differences are not necessarily objectively measured. Specifically, both *no* and *yes* can be used when speakers disagree on the facts, as is the case in virtually all the examples we reviewed in section 4. It seems that where the difference between 'two' and 'three' ((26a) uttered in most contexts), between 'many' and 'all' (in (40)) (extinction will only follow once all the birds are infertile), and between *most* and *every* (in (41a)) matters to the speaker, supplying a higher number/quantity justifies an initial *no* (see also Carston 1990). Where the difference between 'many' and 'all' (in (26b), between the numbers in (38), (39)), and between 'beautiful' and 'pretty' is less crucial (Heritage 2002:218 says that Margy in (41b) creates a "pseudo-agreement"), an initial *yes* is preferred.[29] Given that the choice between initial *yes* and *no* is interactionally dictated according to how relevant the difference between the different positions is taken to be, we can account for the intuition that *most*-to-*all* corrections tend to trigger an initial *yes*, whereas a number-to-a higher number correction tends to trigger an initial *no*. As I argued above, the latter difference is more often objectively and interactionally more relevant than the former.

A related factor at work here, contributing to the preference for an initial *no* for the number corrections, but not for *most*, is again a function of the tendency to interpret numbers punctually,

[29]Interestingly, Horn (2005) draws upon a similar distinction in his account for why (i) is marginally acceptable, but (ii) is not:

(i) ∼A: Is dinner almost ready?
B: ?Yes, it's ready (Horn's (24a)).

(ii) ∼A: Is Fredo almost dead?
B: #Yes, (in fact) he's totally dead (Horn's (24b)).

There is a smaller gap between dinner being ready and dinner almost being ready than between Fredo being totally dead and Fredo being almost dead.

whereas *most* as covering a wide range. Just because the numbers denote precise values, it is plausible that the speaker intends an 'exactly' enrichment when she uses a number. Since she chose such specific quantification, it is likely that she meant no more and no less than that value. Thus, the common interpretation of the numbers as 'exactly n' accounts for the relative ease of denying a lower number when a higher one is the case. It would follow that speakers would perceive as more crucial a correction of a punctual value than of a wide-range value. Hence the intuition that a corrected number value cooccurs with an initial *no* more than a scalar quantifier. If I am right, and the difference pertains to punctuality vs. range, rather than to numbers vs. *most*, then when numbers are interpreted as 'about n' (round numbers normally – see Jespersen 1949:586–7), they should pattern with *most*, rather than with nonround numbers, so they too should show a preference for an initial *yes*, rather than *no*, when the responder proposes that a higher number is the case. This is indeed so, as we have seen in (39). *Half*, I predict, should be a hybrid case. While it is punctual, it seems to have a rather large "slack" (see the results in Papafragou & Schwarz to appear), larger than nonround numbers, at least. The distributional differences between *most* and the numbers re negation can then be attributed to the punctual-range difference between them, and to the difference in whether they constitute contextually distinct alternatives, combined with stance (dis)alignment decisions. Since the numbers are punctual, correcting them in any direction more easily justifies a disagreeing stance (indicated by an initial *no*). Since the difference between *most* and *all* is not very crucial interactionally in many cases, speakers don't usually feel they have to adopt a disagreeing stance when correcting a *most* to *all*.

A third factor involved in the occurrence of a "unilateral" interpretative pattern is the applicability of downwards entailments and upward compatibility, or as I call them, part-whole inferences. As we have already seen in section 3, this is a pragmatic phenomenon. Downward entailments, argues Koenig, following Anscombre & Ducrot (1983), can be inferred based on our world knowledge. It is our world knowledge that tells us that if *Vaska and I drank four bottles of brandy between us* (Collins CoBuild) then 'Vaska and I must have drunk three bottles of brandy between us', but "such entailments derive from our world-knowledge of consumption" (Koenig 1991:145). The same is true for *all* and *most*/*some*. Sometimes the entailment is accepted, at other times, it is not. Newstead (1995), for example, found that a great majority of his subjects said that 'some' is not implied by 'all'. Larger parts ('all', 'most') often, but not invariably, entail that smaller parts ('some') are true (see (18) above). Similarly, smaller parts are sometimes, but not always, seen as compatible with the predicate applying to larger parts/wholes. We therefore do not need specialized lexical scales for this purpose.

To see that upper boundedness is only statistically correlated with blocking of part-whole inferences, consider the following:

(48) Vaska and I drank **four** bottles of brandy between us. (Collins CoBuild)

(48) seems to be true in case 'we drank five bottles . . . ', and allows for an inference that 'we drank three bottles . . . '. Similarly,

(49) **Most** Israelis decided for peace.

seems to be true in case 'all Israelis decided . . . ', and allows for an inference that 'half/some of the Israelis decided . . . '. In these examples we see that both the numbers and *most* enable upward compatibility and downward entailments (but see the questionnaire results for (18)). Now, what about a bounding expression such as *between 70% and 80%*? Its compositional

meaning restricts it to 'no less than 70% and no more than 80%' (see Keenan 1996), which should be incompatible with states of affairs in which '90%' is true. Unlike *most*, bounding expressions explicitly exclude the application of the predicate to the higher values. Even so, 23/23 of my students chose an 'at least 70–80%' interpretation for the counterpart expression in Hebrew when I created an appropriately biasing context:

(50) Maya is a new teacher, who will start teaching at a school next year. She very much wants to do well on her job. Galit, the principal, tells her that she has decided to assign her to an especially weak class. The following conversation takes place at the beginning of the school year:

Galit: The Ministry of Education tests will be conducted in 6 months. It's a good idea to start preparing the students, especially your class. If half of the students in your class pass the tests it'll be an excellent achievement.
Maya: I promise you that **between 70% and 80%** of the students will pass the tests.
Galit: Let's hope so. You know that the education system has no provision for bonuses, but if this miracle happens, I will get you a 3,000 sheqel bonus.

7 months later it turns out that 90% of Maya's students passed the tests.

QUESTION: In your opinion, will Maya receive the 3,000 sheqel bonus?

100% of the subjects chose "yes". Thus, even a noncontroversially upper-bounded expression such as *between 70% and 80%* can be taken by subjects as compatible with a higher (90%) value, given the right circumstances. The lexical upper bound seems unable to block part-whole inferences here when they are called for contextually. The (linguistic) question of upper boundedness is therefore independent of the (pragmatic) question of whether part-whole inferences are allowed.

Note that just like "wide-range" numbers take the "unilateral pattern", so should a punctual quantifier, such as *half*, take the "bilateral pattern". Indeed, Papafragou & Schwarz (to appear) show that subjects refused to accept 'all' as compatible with *half*. In other words, they refused to allow for a part-whole inference here. *Half* here patterns with the numbers, rather than with *most* (in fact, it seems even more "bilateral" than the numbers). Part-whole inferences tend to be blocked or encouraged according to contextual circumstances (This is my interpretation of the results reported in Papafragou & Schwarz to appear).

All in all, section 4 has argued that *most* patterns with the numbers in that the scales they participate in are subject to the same pragmatic constraints. Whether or not downward entailment works, whether or not the scales are reversible, their behavior under negation and their behavior as discourse antecedents are all pragmatically determined, and hence, show statistical tendencies, rather than absolutely different patterns.[30] These differences, however, are due to the punctuality and interactional distinctness differences, as well as to the (non)applicability of part-whole inferences, all of which are irrelevant to the question of the upper bound. In other words, I am proposing that the differences noted in the literature are not defined over numbers

[30]Alternatively, if Chierchia's (2004) account is applicable to all the cases above, then the factors involved are semantic rather than pragmatic.

vs. scalar quantifiers per se. The "Bilateral pattern" is statistically associated with the numbers more often than with the scalar quantifiers, because the numbers tend to be punctual, and often constitute very well-defined distinct alternatives. The scalar quantifiers tend to manifest a "unilateral pattern", because they tend to denote a wide range, and at least for *most*, the difference between the quantifier and the higher alternative ('all') is not usually interactionally relevant. The nature of the exceptions to the prototypical cases proves that it is the parameters mentioned above that are responsible for the interpretative pattern associated with some form. This is why round numbers (nonpunctual) resemble *most*, why punctual *most* (when the whole is 3 or 4) resembles the numbers, why *some* (clearly more distinct than *most* from the higher value alternative 'all') resembles the numbers, and why *half* (often punctual) resembles the numbers. In addition, part-whole inferences are performed according to our world knowledge, and applied if contextually appropriate. These are equally relevant for *most* and the numbers. I am not even sure that part-whole inferences are more often appropriate when scalar quantifiers are involved. This is why downward entailments don't always apply to both numbers and to scalar quantifiers. It remains to be seen whether the history of the analysis of the meaning of the numbers will not repeat itself for quantifiers and other scalar predicates. Be that as it may, the facts noted in section 4 demonstrate that the different patterns sometimes manifested by *most* and the numbers do not pose an obstacle to analyzing *most* as lexically upper-bounded, just like the numbers are.

5 No lower bound?

Thus far, we have concentrated on the question of upper bound for *most*, ignoring *most*'s lower bound. Indeed, there seems to be no controversy in the literature about the lower bound for *most* (nor for *majority*). Note, however, the following examples, where Hebrew *rov* 'majority' and English *most* denote less than 51%, violating the lower bound assumed by the received view, as well as by my analysis:

(51) a. Yosifov was elected by a **majority** of 41.6% . . . and does not need a second round (Originally Hebrew, *Haaretz* 6.5.2003).

b. Knesset Member Shimon Peres was elected yesterday as temporary chair of the Labor party . . . by a **majority of less than 50%** (49.2%; 631 votes)
(Originally Hebrew, *Haaretz* 6.20.2003).

c. A right wing Serbian National party has won **most** of the votes, but not enough to form a government (BBC World News, 12.29.2003).[31]

In multi-party systems, hardly ever does a party/candidate gain power without a coalition with a few other parties, which then together represent more than 50% of the voters. Since a candidate must receive at least 40% of the votes in order to avoid a second round of elections, and since s/he is expected to form a coalition, receiving 41.6% practically guarantees gaining more than 50% (by forming a coalition) in order to assume office (in a, and similarly, in c, presumably). Peres (in b) is the candidate who received the most votes, even though he got less than 50% of the votes, since there were a few, rather than two candidates. Hence, 49.2% counts as 'most'.

[31] Presumably, the party does not have enough votes to form a government because it doesn't have more than half of the votes.

Now, how can we explain this blatant violation of a meaning claimed to be coded by *most*? One option (proposed to me by Edit Doron, p.c.) is to assume that actually plurality, rather than majority is the coded meaning of *most*. This would mean that *most* means 'the largest proper subset', and the prevalent lower bound is actually pragmatically derived. Another option is to argue that *most* is lexically ambiguous between a majority meaning (lower- and upper- bounded, as specified above) and a plurality meaning (only upper bounded). Context then selects the appropriate meaning. A third possibility is that *most* is lower (and upper) bounded lexically, and it is the plurality interpretation which is pragmatically derived. While each of these solutions has some plausibility, they do not all account for the data equally well. I prefer the third option.

Assuming plurality to be the coded meaning of *most*, we can derive the lower bound by inference when context makes it clear that a binary partition is involved. Thus, while the largest subset may be smaller than 51% when there are more than two subsets, it must be at least 51% if there are only two subsets. It then seems quite straightforward to generate the lower bound contextually. All we need assume is that we (nowadays) tend to reduce partitions into one binary partition. This is why there seems to be some competition between the 'largest subset' meaning and the 'above 50%' meaning. Still, it seems that speakers accept the former only in some limited cases, but not in others (for details, see Ariel 2004:6.5). It is hard to imagine, for example, that Barclays Global Mutual Fund, which holds 3.535% of the shares of Ford Motor Company can be said to own *most of the shares*, even though it is the largest share holder of that company, and thus has the most shares.[32] So it doesn't look like being 'the largest subset' guarantees an appropriate use of *most*, which it should: ∼*Barclays Global owns most of the shares of Ford Motor Company* seems to express a false proposition (and not just an inappropriate utterance).

Because those cases where speakers accept as majorities percentages lower than 51% are rare, pragmatically restricted, and not consistent and stable enough, I favor the solution maintaining a lexical lower bound. The findings reported in Ariel (2003, 2004) demonstrate a categorical difference between the acceptance of 50% and 51% for *most* (but not between 49% and 50%, for example – see Figure 2), and attest to the hard-edged categorical nature of the lower bound. (Or, alternatively, to the automatic reduction into a binary partition contrasting some majority with some minority). This is why I tend to reject an ambiguity solution. If I am right, and the original plurality meaning has given rise to a lower (and upper-) bound majority meaning, we have to assume that where plurality (of subsets smaller than 51%) allows for the use of *most*, the linguistic meaning has been loosened up (I here adopt the Relevance-theoretic concept – see Carston 2002:Chapter 5). Note also that the journalist in (51b) explicitly mentions the fact that the quantity involved is less than 50%, which should not be noteworthy if *rov* simply refers to plurality. Interestingly, the same election result reported in (51a), when announced in the news ("Reshet Bet", 6.4.2003), did not get labeled *rov*. However, the question of plurality vs. majority for *most* deserves further research.

6 Conclusions

In Ariel (2004) I have argued that what pragmatics cannot deliver (irrelevant "forced" 'not all' implicatures), semantics must (a lexical upper part). I have here argued that lexical semantics is indeed up to the challenge. I suggest that *most* means 'a proper subset which is the largest subset, given any partitioning of the complement set (into one or more subsets)'. This definition entails

[32] I thank Eric Berger, p.c. for finding such a case for me, which is valid for December 2003.

an upper (in addition to a lower) bounded lexical meaning, namely, that the quantity denoted by *most* is more than half and less than all. I have emphasized that the same **lexical** status should be attributed to the upper bound as to the lower bound for *most* (but not for *more than half*).[33] I believe that a circumbounded lexical meaning for *most* makes for a cognitively more reasonable concept to be coded by a single morpheme (Cf. the complex expressions for quantities lacking one bound: *more than half, at least half, at most half*).

Once we view the upper bound as lexically determined, the division of labor between lexical semantics and pragmatics is (partly) altered. I propose to shift some of the pragmatic burden to lexical semantics (a weaker version of the received view 'not all'), and some of the semantic burden of *most* to pragmatic inferential processes (the confirmation of the compatibility with 'all'). In addition, however, (pragmatic) implicatures are still responsible for classical pragmatic phenomena: The generation of 'not all' and 'possibly all' implicatures in a minority of cases where these are intended by the speaker, as well as for the understanding that the quantity denoted by *most* is noteworthy (Ariel 2004:see). Note that both 'not all' and 'possibly all' inferences may have two rather different cognitive statuses. The unmarked case is for the upper bound to apply just because the speaker denoted 51–99% (for short), so that amount alone is profiled. In the unmarked case 'not all' is true but irrelevant, because 'all' is irrelevant, and addressees don't consider set members not denoted. But when a 'not all' implicature is generated (as I argued in Ariel 2004, this happens when there is a specific expectation for 'all'), 'not all' is profiled. In this case 'not all' (as well as 'all') are relevant in the discourse, and addressees do consider set members not explicitly denoted. The same is true for 'possibly all' implicatures (when *most* is enriched to 'at least most'). In such cases 'possibly all' is profiled. In the unmarked case, however, where no such implicature is generated, 'possibly all' is not profiled, and hence, a pragmatic inference is needed in order to view the speaker's proposition as compatible with 'possibly all'.

Note that on my view there is then a difference between implicating 'possibly all' or 'not all' and allowing for *most* to be compatible with 'all'/'not all'. As we have seen above (and see Ariel 2004 and Papafragou & Schwarz to appear), the latter pragmatic inferences are not guaranteed. Subjects are quite often reluctant to draw them, refusing to view a *most* utterance as compatible with 'all'. This is not the case for when 'possibly all' is implicated. I doubt that there will be many addressees who will refuse to accept the 'at least most, possibly all' interpretation in ex. (4). But if implicated 'possibly all' and 'not all' are profiled in certain uses of *most*, what is the difference between these implicatures and explicit assertions of *possibly all* and *not all*? The difference is that the former can always be cancelled. The latter can only be taken back by a correction.

It is my hope that my work on *most* will encourage researchers to re-examine the division of labor between semantics and pragmatics for all the scalar expressions with respect to lower-bounded-only lexical meanings. I suggest that linguists apply the important distinction proposed by Koenig (1991) between truth-compatibility and lexical meaning, in order to avoid 'surplus' semantic analyses. Whereas lexical meanings must enable truth compatibility, they should not be viewed as the sole direct source for this compatibility. I believe that once we impose this distinction, we will offer more realistic lexical meanings, ones which account for actual speakers' intended meanings. In the case of *most*, I have proposed that attending to this distinction yields a

[33]Recall that an equally marginal percentage of responses were in violation of the lower and the upper bounds of *most* (see again Table 1).

'just that' semantic analysis, which should be preferred over an analysis where a default meaning is derived indirectly, via an implicature. I would not be surprised if other scalar quantifiers and predicates can also receive a 'just that' circumbounded lexical semantics.

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Appendix A

An alternative formalization of my proposal for a lexical meaning for *most* was kindly offered to me by Uriel Cohen (p.c.). According to his formulation, *most Q are P* means: QP is a proper subset of Q which is P, such that for every subset of Q which is disjoint from QP, QP is larger than it.[34] Compatibility with 'all' is inferable by the addressee when for some contextual reason awareness is drawn to the fact that 'all' may in fact be the case (see section 3). QP can then be chosen as the known subset of Q which is P, and the fact that the speaker did not explicitly rule out the possibility that 'all' is the case serves as a basis for an inference that the possibility that Q-QP (the complement of the reference set) is also P is not denied. This is why 'possibly all' can be consistent with a *most* utterance. Note, however, that compatibility with 'all' is distinct from a 'possibly all' implicature on my account (see also Ariel 2004). The former is not an interpretation intended by the speaker, the latter is.

Let us now see what happens when the speaker intends to convey more than the lexical meaning of *most* via implicatures (for a more detailed discussion see Ariel 2004). 'Possibly all' is generated as a Particularized Conversational Implicature, when the speaker intends to convey that she's actually entertaining the possibility that 'all' (even though she only undertook upon herself to assert P of a subset of Q – see ex. (4)). In this case, then, there is no speaker commitment to the existence of a disjoint subset of Q. Next, if 'all' is contextually expected, a 'not all' implicature is derived from QP being a proper subset of Q combined with a comparison to the expected but not asserted 'all' (this is the default case under the received view, but is rather rare on my analysis – see Ariel 2004 for examples). In this case the speaker is actually ruling out the possibility that 'all', even though this implicature, like all implicatures, may be cancelled. Finally, the plurality 'largest subset although less than half' reading (see section 5) can be pragmatically derived when Q-QP (the complement of the reference set as a whole) is not very accessible (i.e., salient in context), while there are many accessible competing subsets of Q which are disjoint from QP and from each other. In other words, when the complement of the reference set denoted by *most* is not conceived of as one unified subset which would then count as the majority (a context-dependent phenomenon – see Ariel 2004), these disjoint subsets put together may be larger than QP. Crucially, however, this unification into one subset is not entertained, each subset disjoint from QP is considered separately, and each is smaller than QP.

[34]Cohen himself, however, claims that there is no need for the "proper" addition to the formula, once he requires the "competing" subsets to be nonempty. It can then be derived referentially, by disallowing *every* to quantify over empty domains. The inappropriateness of 'all' can be accounted for by the proposition being vacuously true, which is pragmatically dispreferred. His analysis can be seen in `http://www.tau.ac.il/~cihenfr`.

PRAGMATICS AND NOMINAL REFERENCE

HOW TO DENY A PRESUPPOSITION

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Abstract

This paper deals with the puzzle of sentences like (ia), which denies (ib).

(i) a. The King of France is not bald, because there is no King of France.
b. The King of France is bald.

In previous analyses of such examples two problems are often overlooked: the first is that (ia) is supposed to express denial of (ib) specifically on the grounds that the existence of a King of France is its presupposition, but it is not clear how, if at all, (ia) does so; the second is that (ia) is not very natural – when speakers wish to deny presuppositions, they usually choose different constructions, e.g. (ii).

(ii) The King of France can't be bald, because there is no King of France.

I argue that the negation in (ia) and (ii) is the standard descriptive negation. Sentence (ii) demonstrates that the existence of a French king is a presupposition of (ib), and rejects (ib) on these grounds. Sentence (ia) is entailed by (ii); hence, when the latter is true, so is the former. However, (ia) is not as good a sentence because it, unlike (ii), does not say that (ib) is denied because of presupposition failure.

1 Introduction*

Suppose someone says to you:

(1) The King of France is bald.

Obviously, there is something wrong with (1): it presupposes (2), which is false.

(2) There is a King of France.

Proponents of semantic theories of presupposition would say that (1) has no truth value, and proponents of pragmatic theories of presupposition would say that it is false (but not assertable), but virtually everyone would agree that (1) is bad and ought to be rejected.[1] So, being better informed about European politics, you wish to correct the speaker who uttered (1). What will you do? Common wisdom has it that one of the plausible things you could say is:

(3) The King of France isn't bald, because there is no King of France.

*I am indebted to Larry Horn for insightful and helpful discussions.

[1]Though there are special contexts where such sentences would be judged acceptable and, in fact, true (Cohen 2000).

The phenomenon of (3) has received considerable interest ever since Russell (1905). Much effort has gone into explaining the projection properties of the negation in (3). It is known that, normally, negation is a hole: it allows presuppositions to project. Thus, (4) is usually just as bad as (1), both presupposing that there is a King of France.

(4) The King of France isn't bald.

However, (3) appears acceptable (though marked – see below), hence we can conclude that the presupposition is not projected in this case.

I do not believe this is a very hard or interesting problem. Any theory of presupposition projection worth its salt ought to make sure that a presupposition is not projected if it contradicts statements asserted globally. Since (3) asserts that there is no King of France, it is no mystery that the presupposition that there is such a person does not project.

What is more challenging, in my opinion, is to explain how (3) succeeds in its goal. Note that while it does deny (2), the presupposition of (1), it does not deny the presupposition *relation* between (1) and (2): it does not deny that (1) presupposes (2). On the contrary, it is precisely because there is such a presupposition relation that (1) is rejected.

So, in order to succeed, (3) needs to express the following claims:

i. Sentence (1) presupposes the existence of a King of France.

ii. This presupposition is false.

iii. Because of i and ii, sentence (1) is denied.

But does (3) really convey these claims? If so, how? Sentence (3) clearly states that there does not exist a King of France, and, moreover, that this fact results in the denial of (1). But, crucially, does it also say that this is because the existence of a French king is *presupposed* by (1)? And, if so, by what mechanism is this fact expressed? I will call this the problem of *presupposition-based denial*: (3) expresses denial of (1) because of its false presupposition.

To see further the significance of this problem, consider (5), which is a denial of (6).

(5) The President of France isn't bald, because he's had a hair transplant operation.

(6) The President of France is bald.

Sentences (3) and (5) have the same form, but are understood very differently: (5) gives a reason why the President of France has hair, whereas (3) gives a reason why (1) is denied. In other words (5) expresses the following claims:[2].

i. Sentence (6) *entails* (rather than presupposes) that the President of France hasn't had a hair transplant operation.

ii. This entailment is false

iii. Because of i and ii, (6) is denied.

[2]Of course, one or more of these claims may be false, in which case (5) will be false

The two sentences also differ in their acceptability: while (5) is perfectly good, (3) is, in fact, somewhat odd. Sentences like (3) are ubiquitous in works dealing with presupposition,[3] so readers of this article are probably quite used to them. But when one tries to look at naturally occurring texts, it is very hard to find examples of presupposition-based denial whose form is similar to (3). When speakers wish to deny a sentence because of its false presupposition they typically make stronger statements.

The point is demonstrated clearly by the following attested text:

(7) The only one who is going to solve my problems is me. God either won't, because he has chosen to remain uninvolved, or can't, because he doesn't exist.[4]

The author of this text says that there are two ways to deny the assumption (8a). Simply negating it, as in (8b), does not deny the presupposition that God exists. In order to deny the presupposition, one needs to use the stronger, modalized (8c).

(8) a. God will solve my problems.

b. God won't solve my problems, because he has chosen to remain uninvolved.

c. God can't solve my problems, because he doesn't exist.

We have seen that sentences like (3) are interpreted quite differently from typical statements of causation like (5). But what, exactly, is the difference between the two? And what is its source?

2 Previous Approaches

As we analyze the problem of presupposition-based denial, it is useful to consider previous views of this issue. It is possible to identify three main approaches.

2.1 Semantically Ambiguous Negation

The first view is that negation is semantically ambiguous.[5] There is the standard type of negation, which does not deny presuppositions, and another type that does. This approach can be stated in one of two ways. According to one version, negation is lexically ambiguous. This idea is usually expressed in terms of theories of semantic presupposition, according to which a case of presupposition failure results in a truth value gap (or a third truth value). In this context, one reading of negation is the standard truth conditional negation: in this case, if (1) doesn't have a truth value, neither does (4). The other reading of negation can be paraphrased as "not true"; a false sentence is not true, but a sentence without a truth value is also not true. Hence, since (1) has no truth value, it is not true, and so, under the second reading of negation, (4) is true.

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[3]Though this has not always been the case; early work on presupposition (Frege 1892; Strawson 1950) does not even contemplate such sentences.

[4]Found on the Web, at `http://www.herbertwarmstrong.com/state_of_denial.htm`

[5]Horn (1989) traces this view all the way back to Aristotle; in the 20th century it is associated with, among others, Russell (1905), Karttunen & Peters (1979), and proponents of three-valued logics (e.g. Lukasiewicz 1967; Bochvar 1981).

The idea that, cross-linguistically, negation is lexically ambiguous is not very plausible, if only because no known language makes a lexical distinction between the two alleged types of negation (Gazdar 1979).

An alternative view is that there is only one negation, but it exhibits scope ambiguities. Thus, Russell (1905) suggests that (4) is ambiguous between (9a) (which entails the existence of the King of France) and (9b) (which doesn't).

(9) a. $\exists x(\textbf{KoF}(x) \wedge \forall y(\textbf{KoF}(y) \rightarrow y = x) \wedge \neg \textbf{bald}(x))$

b. $\neg\exists x(\textbf{KoF}(x) \wedge \forall y(\textbf{KoF}(y) \rightarrow y = x) \wedge \textbf{bald}(x))$

The negation is the same, but in (9a) it is inside the scope of the existential quantifier, whereas in (9b) it takes scope over it.

This solution appears to work in the case of existential presupposition. In order to generalize to other cases of presupposition it is necessary, however, to postulate some sort of truth or assertion predicate, which interacts scopally with negation (Bochvar 1981; Kroch 1974; Linebarger 1981). Thus, the two readings of (4) can be paraphrased as:

(10) a. It is true that the King of France is not bald (the presupposition projects).

b. It is not true that the King of France is bald (the presupposition does not project).

The main problem with this proposal is that the addition of this truth or assertion operator is not well motivated, apart from its intended use to explain presupposition-based denial. In fact, as Horn (1989:413–419)) demonstrates, any reasonable interpretation of this operator yields unsatisfactory results.

Moreover, it should be pointed out that assertion operators for which there *is* independent evidence have different properties. For example, Jacobs (1988) considers the phenomenon of free focus, exemplified by (11).

(11) [John]$_F$ has read Hamlet.

He proposes that the sentence is inside the scope of an ASSERT operator; this operator entails that the sentence in its scope is true, and presupposes that alternatives to it are under discussion. Thus, (11) presupposes that we are considering various individuals, and discuss which one of them has read Hamlet.

It may be attractive to explain the two interpretations of (4) by hypothesizing that negation may interact scopally with the ASSERT operator. But this would mean that (12) ought to be ambiguous.

(12) [John]$_F$ hasn't read Hamlet.

Under one reading, negation would be inside the scope of ASSERT, and the sentence would presupposes that the question under discussion is who hasn't read Hamlet; under the other reading, negation would scope over ASSERT, and the sentence ought to presuppose that the question under discussion is who *has* read Hamlet. However, (12) is not ambiguous in this way, and can only have the first interpretation. We conclude that negation must be inside the scope of ASSERT, and this result casts serious doubts on the possibility of explaining (4) in terms of scope.

2.2 Pragmatically Ambiguous Negation

Another possibility is that negation is ambiguous, but pragmatically, rather than semantically (Horn 1989). According to this view there is, in addition to the usual, descriptive use of negation, a *metalinguistic* use. Metalinguistic negation applies to utterances, rather than sentences, and rejects them, for any grounds whatever, including their form, register, falsity of conversational implicature, etc. For example:

(13) a. I didn't manage to trap two monGEESE – I managed to trap two monGOOSES.

b. Phydeaux didn't SHIT the rug, he had an accident on the carpet.

Sentence (13a) expresses rejection of (14a) because of its form – incorrect pluralization of *mongoose*. And (13b) rejects (14b) because of its inappropriate register.

(14) a. You managed to trap two mongeese.

b. Phydeaux shat the rug.

Horn proposes that presupposition-based denial, as in (3), is a case of metalinguistic negation. According to this view, a speaker who utters (3) says, in effect, something like: "I reject the utterance of (1), on some unspecified grounds."

Horn has shown convincingly that there is, indeed, such a metalinguistic use of negation. But is this the right approach to the phenomenon of presupposition-based denial? This idea is quite widely accepted; it is endorsed by scholars who have such different views on the nature of presupposition as Burton-Roberts (1989) and Carston (1998). This view therefore merits careful consideration.

Horn espouses a pragmatic view of presupposition. According to him, a sentence like (1) is literally false; in addition to its falsity, it is not assertable, because its presupposition is not satisfied. It follows that, if a sentence presupposes false information, its descriptive negation must be true. Why, then, do we need metalinguistic negation in this case? Because, while true, the descriptive negation of a sentence like (1) is not assertable (Horn 1990). Truth, of course, does not guarantee assertability: (14b), for example, may very well be true, and still considered unassertable.

Note that, in this regard, the application of metalinguistic negation to perform presupposition-based denial is very different from the application of negation to deny a sentence for other grounds: in the case of presupposition-based denial, both the metalinguistic and descriptive negations are true (though they differ in acceptability), but in all other cases, the truth values may differ. For example, taking negation to be descriptive, (13a) is probably true, though (13b) is probably false.

This difference manifests itself in the fact that the form of presupposition-based denial is different from other uses of metalinguistic negation. Note a difference between (3) and (13): in the former, we reject a sentence and provide an *explanation*; in the latter, we reject a sentence and provide an *alternative*. It is as if in (3) we mean: "Don't say X, for the following reason: X presupposes Y, which is false." But in (13), instead, we mean something like "Don't say X, say Z instead!"

Thus, if presupposition-based denial were the same as the cases of metalinguistic negation, denying (1) would result in something like (15), rather than (3).

(15) The KING of France isn't bald – the PRESIDENT is!

In (15), the utterance (1) is rejected, and stress indicates that the cause of the rejection is the use of the word *King*. An alternative (*President*) is then proposed. Crucially, (15) doesn't explain why (1) is bad: it *could* be because there is no King of France, but it also could be because of other reasons, say simply because the King does exist, but he sports a magnificent mane.

If we could use metalinguistic negation in (13) in a way analogous to (3), we would get:

(16) a. *I didn't manage to trap two monGEESE, because 'mongoose' forms a regular plural.

b. *Phydeaux didn't shit the rug, because this is not a ladylike way to talk.

The sentences in (16) are rather bad, much worse than (3). Adding a *because* clause to the sentences in (13), then, is impossible; but this is not a problem, since the reason for rejecting the sentence can be indicated by stress. However, no way of placing stress on the negation of (1) could make it clear where the problem lies; the *because* clause (or something like it) in (3) is necessary, and without it the sentence would be rather bad.

Burton-Roberts (1989) is aware of this difficulty, and he proposes that (3) involves, in addition to metalinguistic negation, also a metalinguistic use of *because*. He claims that the use of *because* in (3) is the same as its use in sentences like the following:

(17) a. John is going out because he has his hat on.

b. Max is in because I can see smoke coming out of his chimney.

In these examples, *because* is not used to state the cause of the truth of a certain proposition, but the reason for the speaker's saying it.

However, Horn (1990) argues persuasively against this view. He points out that if we make it clear that we express real causality, the sentences in (17) become odd, but (3) remains good:

(18) a. *John is going out, and that's because he has his hat on.

b. The King of France isn't bald, and that's because there is no King of France.

(19) a. *Max is in, and do you know why? For the simple reason that I can see smoke coming out of his chimney.

b. The King of France isn't bald, and do you know why? For the simple reason that there is no King of France.

Sentence (18a) can only be understood as saying that John's wearing a hat caused him to leave, and (19a) only has the ridiculous reading where the cause of Max's staying in was the fact that the speaker saw the smoke coming out of the chimney. Consequently, it appears that *because* in (3) expresses ordinary causality, just like it does in (5). We are therefore back to the problem exemplified by the sentences in (16).

In addition to these considerations, there are a number of tests proposed by Horn to distinguish metalinguistic negation from descriptive negation. It is instructive to apply these tests to presupposition-based denial. One test uses the fact that metalinguistic negation cannot take the form of a prefix like *un-*. For example, (20a) is fine, expressing metalinguistic negation (in this case, on the grounds of falsity of implicature). However, when the negation is expressed with an *un*-word, as in (20b), the sentence is unacceptable.

(20) a. It's not possible for you to leave now – it's necessary!

b. *It's impossible for you to leave now – it's necessary!

Let us see how well this test applies to presupposition-based denial. At first, it appears to indicate that, indeed, *un*-words are impossible:

(21) *The King of France is unhappy, because there is no King of France.

However, Geurts (1998) presents cases of presupposition-based denial where *un*-words appear to be acceptable:

(22) It is impossible that you met the King of France, because there is no King of France.

Searching the Web, I managed to find a naturally occurring example of presupposition-based denial with the word *unable*:

(23) An interesting sidelight is that this new technology of DNA tracing has led scientists to the hypothesis that all humans descend from a single woman, who they call 'Eve'. They are busily searching for Adam – who they say is harder to find because genetic variabilities are harder to trace in the male line. It hasn't occurred to them that they might be unable to find him, because he doesn't exist.[6]

I will return to these examples below, but for now all we can say is that the test is inconclusive.

Another test proposed by Horn employs the fact that metalinguistic negation, unlike descriptive negation, does not license negative polarity items:

(24) a. Chlamydia is not sometimes misdiagnosed, it is frequently misdiagnosed.

b. *Chlamydia is not ever misdiagnosed, it is frequently misdiagnosed.

Sentence (24a) successfully uses metalinguistic negation to reject a sentence whose implicature is false. The negation scopes over the word *sometimes*; if the word is replaced with its negative polarity counterpart, as in (24b), the sentence becomes bad.

What about presupposition-based denial? Here, it appears that negative polarity items *are* licensed, indeed required:

(25) The King of France doesn't have $\left\{ \begin{array}{l} \text{any} \\ \text{*some} \end{array} \right\}$ hair, because there is no King of France.

Geurts (1998) makes the same point, and presents the following examples:

(26) a. Walter didn't give his ukulele to $\left\{ \begin{array}{l} \text{anybody} \\ \text{*somebody} \end{array} \right\}$: he never owned a ukulele.

b. Walter didn't $\left\{ \begin{array}{l} \text{regret at any time} \\ \text{*sometimes regret} \end{array} \right\}$ that he betrayed his wife: he has always been faithful to her.

[6] `http://parthenogenesis.tripod.com/Parthenogenesis_2001.html`

With respect to this test, then, presupposition-based denial is quite unlike metalinguistic negation, but instead is like descriptive negation.

It might be objected that this claim ought to be further tested with expressions that are even more clearly negative polarity items, such as *contribute one red cent* or *lift a finger*. In fact, Linebarger (1981) claims the following example is ruled out:

(27) The King of France didn't contribute one red cent, because there is no King of France.

If this judgment is granted, this would support Horn's proposal that presuppositions are denied by metalinguistic negation. I am not sure, however, that (27) is indeed so bad. Imagine that, shortly after the execution of Louis XVI, the French National Assembly approves a sum of money to be contributed to some needy citizen. The recipient, unaware of the King's fate, believes that Louis is the source of the gift, and praises him profusely. I think we can well imagine Robespierre uttering (27) in anger.

Indeed, I have managed to find an attested example of a similar negative polarity item in the scope of presupposition-based denial. The following story appeared in the August 1993 issue of *Guideposts Magazine*.

> This guy is talking to a priest and says, "Father, you got it all wrong about this God stuff. He doesn't exist. I oughta know."
>
> "Why's that, my son?"
>
> "Well, when I was ice-fishing in the Arctic far from the nearest village, a blizzard blew up with wind and blinding snow. I was a goner. So I got down on my knees and prayed real hard, begging God for help."
>
> "Did He help you?"
>
> "Nope, God didn't lift a finger. Some Eskimo appeared out of nowhere and showed me the way."

In the context of this story, it would be perfectly acceptable for the protagonist to say:

(28) God didn't lift a finger to help me because He doesn't exist.

The third diagnostic involves concessive vs. contrastive *but*. In languages that make a lexical distinction between the two, metalinguistic negation allows only contrastive *but*, never concessive. The following examples are from Spanish:

(29) a. *No es cierto, pero es probable.*
'It isn't certain, but (concessive) probable.'

b. *No es probable,* { **pero* / *sino* } *es cierto.*
'It isn't probable, but (contrastive) certain.'

Sentence (29a), which expresses descriptive negation, uses the concessive *pero*; in contrast, (29b), which expresses metalinguistic negation, must use the contrastive *sino*.

What about presupposition-based denial? It seems that *but*, under either reading, is ruled out:

(30) *The King of France isn't bald, but there is no King of France.

This holds also in a language that makes a lexical distinction between the two *but*s. Hebrew distinguishes between the concessive *aval* and the contrastive *ela*, yet both are equally bad in the translation of (30):

(31) **melex* *tsorfat* *lo* *kereax,* *aval/ela* *ein* *melex* *le-tsorfat.*
the-king-of France not bald but no king to France
'*The King of France isn't bald, but France doesn't have a king'.

Therefore, the third test is inapplicable to the case of presupposition-based denial.

To summarize, the results of the three tests are as follows: the third is inapplicable, the first is inconclusive, and the second test actually fails. I conclude, therefore, that presupposition-based denial uses descriptive, rather than metalinguistic negation.

2.3 No Ambiguity

We appear to be left with the third option: negation is not ambiguous, either semantically or pragmatically. Geurts (1998) takes such a view. According to him there is no difference at all between (3) and (5): in both we have run-of-the-mill descriptive negation, and the same meaning of *because*. The only difference is that the presupposition of (5) projects, but that of (3) does not, because projecting it would result in inconsistency.

This view, however, does not really address the question we are trying to answer. It explains why the presupposition doesn't project, but not why (3) succeeds in making the point that the existence of a French king is falsely presupposed by (1). The causality in (3) does do something important, a fact that distinguishes (3) from other cases where presuppositions fail to project.

The distinction is not merely theoretical, but has empirical consequences. Note the difference in acceptability between (3) and the following examples:

(32) a. *There is no King of France, and the King of France isn't bald.
b. *The King of France isn't bald, and there is no King of France.
c. *There is no King of France, and if the King of France is bald, his barber is idle.

All these examples ought to be just as good as (3), according to Geurts's theory; in all of them, the presupposition that there is a King of France ought to be accommodated locally, rather than project, and the sentences ought to be fine. However, the examples in (32) are clearly nonsense. The difference between them and (3) is that only the latter expresses the claim that the failure of the presupposition is the cause of the denial of (1).

We can conclude that none of the available approaches explains how presupposition-based denial operates. What, then, is the explanation?

3 Demonstrating a Presupposition Relation

A common problem with all previous approaches to presupposition-based denial is that they do not provide any account of how (3) expresses the fact that (1) presupposes something (which is false). But, after all, this is precisely the reason why we want to reject (1): it presupposes (2),

which is false. Suppose we wanted to demonstrate this fact to the speaker of (1). How would we do this?

Let us go back to the way presupposition is normally taught in introductory semantics/pragmatics courses. How is the notion of presupposition first demonstrated? Well, usually some standard tests are used.

3.1 Negation Test

One such test is negation; it uses the fact that descriptive negation is usually a hole, and lets presuppositions project. So, if B follows from both A and its negation, then A presupposes B. Indeed, there is a clear pretheoretical sense in which (2) follows from both (1) and its negation. Of course, there are marked cases (such as (3)) where the presupposition does not follow; but in the unmarked case, there is no question that it does. Different theories of presupposition have different things to say on what exactly it means to say that a presupposition follows from a sentence (e.g. an entailment, or a prerequisite for assertability); but there is no argument that it does.

So, if we want to tell our friend that (1) presupposes (2) we could say something like

(33) If The King of France is bald then there is a King of France, and if the King of France is not bald then there is a King of France.

From (33) it follows that

(34) If the King of France is bald or the King of France is not bald then there is a King of France.

Applying contraposition, we get:

(35) If there is no King of France then the King of France is neither bald nor not bald.

To conclude our argument that (1) ought to be rejected, we must conjoin (35) with the proposition that there is no King of France:

(36) There is no King of France, and if there is no King of France then the King of France is neither bald nor not bald.

Sentence (36) is a mouthful, and might be too technical to be understood by our ignorant friend. We can make it easier to utter and understand if we replace "p, and if p then q" with "q because p".[7] Of course, saying that p is the cause of q is saying more than simply that p is a sufficient condition for q, though the question of what this "more" consists of has been under debate for centuries. This simplification, however, will do for our purposes here. We can thus turn (36) into (37).

[7] Compare Strawson (1952), who writes:

> Let us say, when the step from one statement to another would, if made, be a correct step in reasoning…that the first statement is a *ground* for the second. …If one statement is a ground for another and we believe the first statement to be true, we are justified in saying something of the form 'p, so q' (p. 37. original emphasis).

(37) The King of France is neither bald nor not bald, because there is no King of France.

Note that (37) is a very natural response to (1); much better, in fact, than (3). Moreover, exactly this type of presupposition-based denial is attested in the works of no other than Strawson, who is usually thought to have ignored any possibility of presupposition-based denial:

(38) Q: Does he care about it?
A: He neither cares nor doesn't care; he's dead (Strawson 1952:18).

Strawson makes clear that this is, indeed, a case of presupposition-based denial: "The answer shows that the question is inappropriate to the circumstances, that some assumption which the questioner is making is untrue." Caring presupposes being alive; if the person under discussion is dead, the presupposition is false, a point made clearly by (38).[8]

This type of presupposition-based denial can also be found in non-linguistic texts. Here is a quote from *Pierrette,* by Honoré de Balzac (translated by K. P. Wormeley):

(39) He reasoned neither ill nor well; he was simply incapable of reasoning at all.

To say of someone that he reasons well – or poorly – presupposes that he reasons in *some* fashion; but Balzac denies this presupposition quite naturally.

3.2 "Possibly" Test

Another standard presupposition test is the "possibly" test. Like negation, the possibility modal is also a hole, so that if B follows from "Possibly A", then A presupposes B. Thus, we could point out to our friend that

(40) If the King of France can be bald, then there is a King of France.

Again, applying contraposition, we get:

(41) If there is no King of France, the King of France can't be bald.

We add the fact that there is no French King, and get:

(42) There is no King of France, and if there is no King of France, the King of France can't be bald.

Again, we can make (42) easier to utter and understand:

(43) The King of France can't be bald, because there is no King of France.

Once more, this sentence is a very natural responses to (1), much more so than (3).

Attested examples of presupposition-based denial usually take this form. We have already seen this strikingly demonstrated by (1), repeated below.

[8]The semicolon in (38) appears to mean something like *because*; cf. (i), which means the same as (5).

(i) The President of France isn't bald; he's had a hair transplant operation.

(44) The only one who is going to solve my problems is me. God either won't, because he has chosen to remain uninvolved, or can't, because he doesn't exist.

Turning to literary texts, here is a quote from *Alice in Wonderland*:

(45) 'Take some more tea,' the March Hare said to Alice, very earnestly. 'I've had nothing yet,' Alice replied in an offended tone, 'so I can't take more.'

Alice says that, since she hasn't had anything yet, she can't take more. Of course, taking more tea presupposes having taken some tea before, and Alice's response to the March Hare makes this point rather clearly.

Lewis Carroll's books are full of paradoxes and strange puns; one might claim that, consequently, the naturalness of (45) is suspect. Consider, then, the following quote from Shakespeare's *The Taming of the Shrew* (Act V, scene I):

(46) **Vincentio:** Come hither, you rogue. What, have you forgot me?
Biondello: Forgot you! no, sir: I could not forget you, for I never saw you before in all my life.

Forgetting someone presupposes having seen them before. In this exchange, Biondello, who pretends never to have met Vincentio before, makes this point clearly and naturally, and his sentence has the same form as (43).

This, then, is the way to perform a presupposition-based denial: demonstrate, using some standard test for presupposition, that a certain statement is presupposed by the speaker, and point out that this statement is false. And while there probably are metalinguistic uses of negation, and metalinguistic uses of *because*, the task of presupposition-based denial requires nothing more than descriptive negation, and the usual meaning of *because* (or similar devices).

3.3 Denial by Simple Negation

This is not, however, quite what (3) does. We have explained how sentences like (37) and (43) deny (1) on the grounds of its false presupposition. But what about (3)? How does *this* sentence succeed in denying (1)? And why is it not as good as (37) or (43)?

To answer this question, consider (37) again. The sentence says that, because there is no King of France, he is neither bald nor not bald. Note that if the King of France is neither bald nor not bald, he is not bald: $\neg(p \vee q)$ entails $\neg p$. Therefore, (37) entails (3).

Now consider (43). This sentence says that because there is no King of France, he can't be bald. Now, if the King of France can't be bald, he is not bald. Hence, (43) also entails (3).

Therefore, if either (37) or (43) is true, so is (3). But (3) can also be true in circumstances where (37) or (43) are not. Specifically, (3) says that the existence of a French king follows from (1), but does not require it to follow by way of presupposition; it may be an entailment. Indeed, if (5) is true, this would be because baldness entails, rather than presupposes, failure to undergo a hair transplant operation. Hence, (3) is not sufficiently informative – it violates Grice's (1975) Quantity maxim.

In general, an utterance that violates a maxim can be judged odd, or misleading, but would not normally be so bad as to be unassertable; it may be assertable, though odd. This is why (3) is true and assertable, but it is not as good as (37) or (43).

Perhaps the point can be made clearer by looking at Strawson's (1952) example, repeated below:

(47) Q: Does he care about it?
A: He neither cares nor doesn't care; he's dead.

In this exchange, the answer is perfectly natural and appropriate. But suppose the answer were (48) instead.

(48) He doesn't care about it because he's dead.

I think it is fair to say that (48) is a bit odd; unlike (47), it is not easily interpreted as denying the presupposition that the person in question exists. Instead, (48) seems to imply that the presupposition *is* satisfied, and the dead man still enjoys some sort of (presumably carefree) existence.

This judgment is strengthened by the following passage from Robert Graves's *Claudius the God and His Wife Messalina*. Claudius is looking for a certain witness to testify, but the man is not in court. The Emperor then asks the court-official whether he is ill, and the following dialogue ensues:

> "No, the witness is not ill now. He has been very ill, I understand. But that is all over."
>
> "What was wrong with him?"
>
> "He was mauled by a lion, I am informed, and afterwards gangrene set in."
>
> "It's a wonder he recovered," I said.
>
> "He didn't," sniggered the fellow. "He's dead. I think that death can stand as an excuse for non-attendance." Everyone laughed (pp. 111–112 of the Vintage International edition).

Saying that the witness is not ill would normally be taken to indicate that he is alive and has recovered, not that he is dead. Indeed, this is precisely the way Claudius interprets the response. When the court-official then adds that the witness is, in fact, dead, it is hard to interpret this as presupposition-based denial, hence the cognitive dissonance and the audience's laughter.

Had the court-official said (49) instead, I think it would be much easier for the readers (as well as Claudius) to realize that the witness is no longer alive.

(49) He is neither ill nor not ill.

We can now go back and explain the conflicting results of the test for metalinguistic negation involving *un*-words. The relevant examples are repeated below:

(50) a. *The King of France is unhappy, because there is no King of France.
b. It is impossible that you met the King of France, because there is no King of France.
c. It hasn't occurred to them that they might be unable to find him [Adam], because he doesn't exist.

Examples (50b) and (50c) are fine for the same reason that (43) is fine: (50b) says that meeting the King of France presupposes his existence, and since he does not exist, such a meeting could not have taken place; and (50c) says that finding Adam presupposes his existence, and since he does not exist, finding him is impossible. Sentence (50a), in contrast, is bad. The reason is that the natural way to deny (51a) is (51b) or (51c). Since both entail (51d), this is also an acceptable, though less informative, way to deny (51a).

(51) a. The King of France is happy.
b. The King of France is neither happy nor unhappy, because there is no King of France.
c. The King of France can't be happy, because there is no King of France.
d. The King of France is not happy, because there is no King of France.

In contrast, *unhappy* is not the negation of *happy*, hence (50a) is not equivalent to (51d). More to the point, it follows from neither (51b) nor (51c), and, consequently, it is not an acceptable way to deny (51a).

4 The Nature of Presupposition

If the account proposed in the previous section is on the right track, it has interesting consequences for theories of presupposition. This account relies on the following two claims:

1. Presupposition-based denial involves descriptive negation only.
2. If there is no King of France, the following sentences are both true:

(52) a. The King of France is neither bald nor not bald.
b. The King of France can't be bald.

If these claims are correct, which theories of presupposition can account for them?

Let us start with (2(52)a). This sentence predicates the negation of the property *bald or not bald* of the King of France. If we assume the standard semantic theory of presupposition, then, since there is no King of France, the sentence ought to lack a truth value. We could try to avoid this consequence by using supervaluation. This will not help, however: the sentence will then come out false, rather than true.

Things are more complicated if we follow a pragmatic theory of presupposition. What is the logical form of (2(52)a)? We might straightforwardly suggest that it is (53).

(53) $\neg(\textbf{bald}(\iota x\textbf{KoF}(x)) \vee \neg\textbf{bald}(\iota x\textbf{KoF}(x)))$

This is the negation of a tautology, so it is a contradiction, hence false, and again we fail to get the desired result.

There is, however, an alternative logical form of (2(52)a), which would give us what we want. According to Horn's (1989) *Extended Term Logic*, root sentences have a subject-predicate form. The predicate may be either affirmed or denied of the subject. Affirmation of a predicate is true iff the denotation of the subject exists, and has the property denoted by the predicate. Otherwise, i.e. if the denotation of the subject does not exist, or does not have the property denoted by the predicate, a denial of the predicate is true. The predicate itself may, of course, be complex, and may involve logical connectives and negative terms. According to this view, (2(52)a) denies the predicate *bald or not bald* of The King of France; it is therefore true, since there is no King of France.

What, then, would the logical form of (2(52)a) be under this theory? An attractive way to formalize the idea is to use structured propositions (Cresswell 1985). A full formalization lies outside the scope of this paper, but I will provide a sketch here.

The structured proposition $\langle A, B\rangle$ predicates A of B, and is interpreted as follows: if the predication fails, e.g. because the denotation of B is undefined,[9] the sentence is false; otherwise, the sentence is true iff the denotation of B is a member of the denotation of A.

For example, the representation of (54a) will then be (54b).

(54) a. The King of France is bald.

b. $\langle \textbf{bald}, \iota x \textbf{KoF}(x)\rangle$

This sentence will be true iff there is a King of France and he is bald.

The representation of (55a) will be (55b).

(55) a. The King of France isn't bald.

b. $\neg\langle \textbf{bald}, \iota x \textbf{KoF}(x)\rangle$

This will be true just in case (54) is false. In particular, if there is no King of France, (55) will be true. Now let us consider (2(52)a). Its logical form would be

(56) $\neg(\langle \textbf{bald}, \iota x \textbf{KoF}(x)\rangle \vee \langle \lambda y.\neg \textbf{bald}(y), \iota x \textbf{KoF}(x)\rangle)$

Now, this is not a negation of a tautology; it is a negation of a disjunction that may be true or false. Since the term $\iota x \textbf{KoF}(x)$ fails to denote, both disjuncts are false, hence the negation of the disjunction is true, as desired.

Let us now consider (2(52)b). An account of its truth can be proposed along the following lines. Modal statements are about accessible possible worlds. To say that ϕ can't be true is to say that in all accessible worlds, ϕ is false. How is the accessibility relation determined? Here it is useful to follow Stalnaker's (1974; 1998; 2002) suggestion that presupposition is a propositional attitude. Hence, it should be represented as an accessibility relation. That is to say, in all accessible worlds, all the presuppositions of the interlocutors, i.e. the propositions in the common ground, are true. Then we get exactly the interpretation we want: if it is part of the common ground that there is no King of France, then there are no accessible worlds where there is a King of France; hence, in all such worlds, (2(52)b), the affirmation of baldness of the King of France, is false. More formally, the logical form of (2(52)b) is:

(57) $\neg\exists x \textbf{KoF}(x) \wedge (\neg\exists x \textbf{KoF}(x) \rightarrow \neg\Diamond\langle \textbf{bald}, \iota x \textbf{KoF}(x)\rangle)$

This logical form says that there is no King of France, and that this fact is a sufficient condition for the impossibility of affirming baldness of the King of France (i.e. in all accessible worlds, being bald is denied of the King of France). Given our assumptions this is, of course, true, hence the truth of (2(52)b). And what about the original (3), repeated below?

(58) The King of France isn't bald, because there is no King of France.

Its logical form would be:

(59) $\neg\exists x \textbf{KoF}(x) \wedge (\neg\exists x \textbf{KoF}(x) \rightarrow \neg\langle \textbf{bald}, \iota x \textbf{KoF}(x)\rangle)$

[9] But there could be other reasons why the predication fails; this would be a natural way to incorporate into the framework other types of presupposition, not just existential presupposition.

This says that there is no King of France, and this fact is a sufficient condition for the denial of being bald of the King of France. Given our assumptions this is, like the previous logical forms, quite true, though less informative and, consequently, not as natural.

To conclude, what, then, is the difference between (3) and (5)? Both use the same type of negation (predicate denial in Extended Term Logic), and the usual *because*. The difference is in their informational content. In sentence (5), the cause is directly related to the effect. Not so in (3), where, instead of the full effect of the cause, we only have something that is entailed by the effect. For this reason, (3) has a different *feel* from (5), as if the causal relation is different, when in fact it is exactly the same in both.

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TYPE SHIFTING OF ENTITIES IN DISCOURSE

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Abstract

Clausally introduced propositions and facts have different referential properties, and different semantic properties, from clausally introduced events, and from entities introduced by nominal expressions. The referential differences can be expressed within Discourse Representation Theory (DRT). This paper provides independent support for the DRT account of the referential differences by pursuing the semantic differences in the associated model theory. Specifically, it is shown that clausally introduced propositions and facts have a higher semantic type than the standard type of propositions, but that they reduce to individuals of type e upon subsequent anaphoric reference. Clausally introduced events, and propositions and facts referred to by nominal expressions, in contrast, are always of type e. Since the discourse representation structures (DRSs) are interpreted in the model theory, the type-theoretic account of the semantic differences reflects back on, and substantiates, the DRSs proposed on more intuitive grounds to account for the referential differences.

1 Anaphoric reference

In the informal ontology of natural language semantics, propositions are objects of belief and other propositional attitudes, and enter into chains of reasoning or explanation. Facts are objects of knowledge or discovery, and can answer questions and resolve disputes. Eventualities – events and states – happen (events), are the case (states), and can cause other eventualities. There is some overlap in these characterizations, but, as illustrated throughout this section, the distinctions among these three kinds of entities are usually made clear by the selectional properties of predicates selecting the expressions introducing these entities, or selecting anaphors which refer back to these entities in a discourse.

Facts and propositions introduced into a discourse by a clause are generally more accessible to immediate anaphoric reference with a demonstrative pronoun than with a personal pronoun such as *it*. This phenomenon has been discussed by Webber (1988, 1991), Gundel et al. (1993) Borthen et al. (1997), Gundel et al. (1999), Hegarty et al. (2002), Gundel et al. (2003) and Hegarty (2003), and is illustrated in (1a)–(3a) below.[1] The constructed (hypothetical) continuations of (1a)–(3a) given in (1b)–(3b), respectively, illustrate a further point: that upon anaphoric reference by the demonstrative pronoun, the propositions and facts in these examples become available for fully felicitous reference with *it*.

[1]The demonstrative forms *this* and *that* appear in the originals; the variants with *it* are included to show the contrast in acceptability. For expository purposes, both forms are in boldface here.

(1) a. For more sophisticated [mathematical] ideas, it is necessary to study the cognitive mechanisms that characterize mathematical concepts. Lakoff and Nuñez argue that these are the same ones that characterize ordinary ideas. **This / #it** leads to the authors' main thesis – that mathematics develops by means of metaphors. (Auslander, Joseph. 2001. *American Scientist* 89:366)

b. And **it** leads to another thesis, not noted by the authors.

(2) a. As our experience with genetics grew, it became clear that most traits, or *phenotypes*, are inherited in more complicated ways than Mendel had described. **This / #it** is because differences between the traits of any two individuals are almost always due to differences in many genes. (H. Frederik Nijhout, "The importance of context in genetics," *American Scientist* 91:416)

b. **It** is also a result of so called "jumping genes."

(3) a. "We believe her, the court does not, and **that / #it** resolves the matter," Mr. Montanarelli said today of Ms. Lewinsky's testimony that she had an independent recollection of the date. (*New York Times*, May 24, 2000)

b. You just have to accept **it**.

In (1a), the proposition that mathematical ideas are based on the same cognitive mechanisms as ordinary ideas is available to immediate anaphoric reference by *this*, but not by the personal pronoun *it*, in the following sentence. However, reference using *it* has become felicitous at the point when the additional sentence in (1b) is processed. In (2a), the fact that phenotypes are inherited in more complex ways than Mendel had described is available for immediate anaphoric reference by *this* but not *it*, but the reference with *this* makes subsequent reference with *it* possible in (2b). Likewise for the fact that we believe her and the court does not, in (3). Reasons and purposes are special cases of facts and propositions (see Hegarty 2003) and exhibit the same pattern, as illustrated in (4).

(4) a. Jill fired Fred because he had made inappropriate remarks to his co-workers. **That / #it** is the reason listed on the personnel forms.

b. And **it** is the reason why we can't hire him.

In contrast, propositions and facts introduced by nominal expressions, rather than by clauses, are rendered accessible to immediate anaphoric reference with a personal pronoun, as shown in (5).

(5) a. Alex then introduced a new proposition. But **it** was immediately pooh-poohed.

b. At that moment, another fact struck Maria. **It** sent shivers down her spine.

c. Jill had a valid reason for firing Fred. **It** was that he made inappropriate remarks to his co-workers.

In further contrast, eventualities (events and states) introduced by clauses are immediately accessible to anaphoric reference with *it*. This is so for the event introduced by the first sentence in (6a), the state introduced by the first sentence in (6b), and the event introduced by the subordinate clause in the first sentence of (7).

(6) a. John broke a priceless vase. **It** happened at noon.

b. Max is quite tall. **It** puts him in constant danger of bumping his head.

(7) I heard that John broke a priceless vase in the museum yesterday. **It** happened when he tried to get a better look at the inscription around the rim.

There are a number of apparent exceptions to the pattern exhibited in (1)–(4) which will be discussed in section 2 below. The exceptions are of interest in their own right, but the discussion in section 2 will show that they are systematic and explicable, and thus they do not obviate the need to explain the pattern observed here.

It's useful to frame these observations in terms of the Givenness Hierarchy of Gundel et al. (1993), according to which a nominal form signals the cognitive status (memory and attention state) which the speaker or writer assumes the referent to have in the mind of the addressee. Of interest for present purposes are the cognitive statuses labeled 'activated' and 'in focus'. An entity is activated for a participant in a discourse if that person has a representation of it in short term (or working) memory. Demonstratives *this*, *that*, and NPs *this* N signal that the referent is assumed to be at least activated for the addressee prior to processing of the referring form. An entity has the cognitive status in focus for a participant if it is activated for that person, and, moreover, at the center of that person's attention. Personal pronouns signal that the referent is assumed to be in focus for the addressee prior to processing of the referring form.

If we suppose that clausally introduced propositions and facts are accorded the cognitive status activated, but not the status in focus, upon their introduction into a discourse, then the Givenness Hierarchy provides a preliminary explanation of the data in (1)–(5). A proposition or fact will be in focus only if mentioned by a nominal expression in a prominent syntactic argument position earlier in the utterance or in the previous utterance; a proposition or fact introduced by a clause is consequently merely activated upon its introduction. But this generalization doesn't extend to clausally introduced eventualities since, as (6)–(7) show, these are accessible to immediate anaphoric reference upon their introduction, indicating that they rendered in focus.[2] Thus, the reason for propositions and facts being relatively less accessible to immediate pronominal reference upon their introduction in (1)–(4), as opposed to (5), cannot reduce entirely to the lesser syntactic prominence of the clause as a referential expression.

The distinctions in referential behavior noted above are adequately reflected within Discourse Representation Theory in ways which will ultimately help explain them better. In DRT, entities in a discourse are entered into discourse representation structures (DRSs), which record and update information about them as they are introduced and subsequently mentioned. A DRS consists of a domain of variables and a condition set of predications over those variables. Nesting relationships among DRSs serve to delimit the scopes of variables introduced in quantified and conditional contexts. The predicate-argument relations expressed by a sentence describing an eventuality are entered into the condition set of the corresponding DRS with a variable for the eventuality serving as a Davidsonian argument; the eventuality variable is entered into the domain of the

[2]The reasoning here can seem circular at first glance, but it isn't. The actual cognitive status of a referent is a fact about the discourse circumstances, and the referring form is chosen to correctly signal that status. However, a linguist analyzing a coherent discourse can draw conclusions about the cognitive status of the referent on an occasion of felicitous use of a referring form, on the hypothesis that the form-status correlations of the Givenness Hierarchy hold generally, or least for that discourse.

DRS, as shown in the representation of the first sentence of (6a) given below in (8).[3]

(8)

x, y, e
John (x) vase (y) ∧ priceless (y) break (x,y,e)

In DRT, clausally-introduced propositions and facts are represented as subDRSs within the DRS of the superordinate (or container) clause; see Kamp & Reyle (1993) and Asher (1993). Following Asher (1993), subsequent anaphoric reference to a clausally introduced proposition or fact introduces an individual which is construed anaphorically with the subDRS.[4] To illustrate this, consider the toy dialogue in (9), and the DRS in (10).

(9) Tom: Bill believes [that Mary is a genius].
Sue: I said that myself. (N.B.: #I said it myself.)
Max: I said it too.

(10)

x, s_1, y, e_1, z, e_2
Bill (x) believe (x, [x_2, s_2 | Mary (x_2); genius (x_2, s_2)], s_1) Sue (y) said (y, p_1, e_1) $p_1 \approx$ [x_3, s_3 | Mary (x_3); genius (x_3, s_3)] Max (z) said (z, p_1, e_2)

The proposition introduced by Tom's subordinate clause is initially represented as a subDRS. At this point in the discourse, this proposition is not in focus, and is accessible to reference with *that* or *this*, but not *it*. The anaphoric reference with *that* effects a relation of anaphoric construal, indicated by ≈, of the proposition with the individual p_1. This renders the proposition in focus, and accessible to subsequent reference with *it*. This account suggests that a subDRS can, in general, have a cognitive status no higher than activated, and that it must be associated with an individual in order to be capable of being in focus. This generalization is recorded in (11).

[3]Davidson (1967) proposed an argument position for events, but not for states. See Higginbotham (2000) for an argument that Davidson's proposal should be extended to states.

[4]Asher (1993) made the distinctions drawn here, treating clausally introduced events and states, in Davidsonian fashion, the same as ordinary individuals, and clausally introduced facts and propositions as subDRSs – see (10) below. But Asher did not note contrasts in referential accessibility such as those illustrated in (1)–(5), which those distinctions will be invoked here to explain

(11) A subDRS can be at most activated in a discourse. Only first order variables in the domain of the DRS can be in focus.

The same holds when the proposition is recovered from a main clause, as in (12) below.

(12) Tom: Mary is a genius.
Sue: I said that / #it years ago.
Max: I said it even earlier.

But a main clause can potentially introduce different kinds of entities: the response to Tom's declaration in (12) could be, *I don't believe that*, where *that* refers to the proposition that Mary is a genius, *I know that*, with *that* referring to the fact that Mary is a genius, or *That is what makes her so dangerous*, with *that* referring to the eventuality of Mary being a genius. Since main clauses can potentially introduce entities of various kinds, examples such as this highlight the fact that selectional properties of the predicate with which the anaphor combines have a crucial role in determining the nature of the entity referred to anaphorically. See Asher (1993, 2000) for discussion of this topic.

This account begins to make explicit what happens to a clausally-introduced proposition or fact as it undergoes successive processing, with concomitant changes in its cognitive status. This contrasts with the situation of propositions and facts introduced by nominals, as in (5). In this case, the nominal directly introduces a first order individual representing the proposition or fact, and anaphoric reference is to that same individual. In a clausal complement of a noun, as in (13) below, the DRS construction algorithm effectively takes the step taken by anaphoric construal in (10) as the content of the clause is assimilated to the proposition or fact denoted by the selecting noun.

(13) The claim that Bill is insane was considered at length. It was eventually dismissed.

This discussion shows that the representation of a proposition or fact within a DRS is a factor determining its accessibility to pronominal reference, alongside the syntactic prominence of the constituent introducing the proposition or fact. The relevant distinctions in the discourse status of the proposition or fact can be represented within DRT. However, the representation of a clausally-introduced proposition or fact as a subDRS, and the construal of the subDRS with an ordinary individual upon subsequent nominal reference, were proposed, and stand today, largely on grounds of their intuitive plausibility. Independent support for these proposals would be welcome. The condition in (11) has essentially the same standing – it fits the facts, and is intuitively plausible. But there are some semantic differences between clauses introducing propositions and facts, and clauses introducing eventualities, and likewise between clauses and nominals when they are used to introduce propositions and facts, and these differences correlate with the differences in referential properties surveyed above. Since discourse representation structures are interpreted through mapping to a model, there is a prospect of illuminating the DRT account of the referential differences by examining a model-theoretic account of the semantic differences. This issue will be broached again in section 4 after facts about the embedding of these entities in model theory are uncovered in section 3, and after the pattern of data in (1)–(4) is clarified through closer examination of apparent exceptions, in section 2.

2 Apparent exceptions to the pronominal reference pattern

The goal of this paper is to return to the pronominal reference facts in section 1 with insights into the semantic type of clausally introduced propositions and facts gained in section 3. Before this can be done, the basic pattern observed in section 1 needs to be more carefully substantiated.

The basic pattern of immediate anaphoric reference to propositions and facts introduced by clauses and other non-nominal constituents, discussed in section 1, is exemplified by (14)–(15).

(14) A: Alex believes that Bill stole the artifact.
B: **That / #it** is implausible. **It** would entail that Maria was in on the scam, and we know that she wasn't.

(15) A: You know what? Alex is a genius.
B: I said **that / #it** when I first met him.
C: I said **it** first.

But a number of examples don't conform to this pattern, including (16) with the contributions by C given in C_1, C_2 and C_3, and the examples in (17)–(18).

(16) A: What does Alice think of Harold?
B: Alice believes that Harold is a thief.
C_1: I believe it too.
C_2: It's true: I saw Harold steal stuff from a store.
C_3: I know it for a fact.

(17) Susan's boyfriend has graduated. But Sally does not believe it. Asher (1993:36)

(18) John believes [that Mary is a genius]. Fred is certain of it. Asher (1993:241)

A number of factors can be identified which facilitate reference with *it* by putting a newly introduced proposition or fact at the center of attention, or by accommodating it to the cognitive status in focus. Gundel et al. (1999) give a particularly revealing example involving a minimal triple, in (19) (with their judgments).

(19) A: You have an appointment with the Minister of Defense at 3.
B_1: That's true.
B_2: ??It's true.
B_3: It's true, then.

In B_1 and B_2, use of *that* and *it* by B to refer to the proposition that B has an appointment at 3 conform to the pattern observed in section 1. But in B_3, *then* somehow facilitates the use of *it* to refer to this proposition. This can be explained as follows. The presence of *then* signals that whatever it accompanies follows as a consequence from A's utterance.[5]

[5]Compare with:

(i) A: You have an appointment with the Minister of Defense at 3.
B: We must leave immediately, then.

If A's utterance is used to introduce the proposition it expresses, (19B_3) would amount to the vacuous condition that the truth of A's utterance follows as a consequence from A's utterance. In this case, the use of *then* would lack contextual effects, in the sense of Relevance Theory, and would be infelicitous. The use of *then* in (19B_3) is non-vacuous, and yields contextual effects, to the extent that A's utterance does not introduce a new proposition, but instead confirms a proposition which B and B's addressee (whether A, or a third party) had been considering and were in some doubt about. Thus, *then* signals that the proposition in question was at the center of attention for B and B's addressee at some point prior to A's utterance, and signals that B_3 is to be interpreted in that context. This is automatically satisfied if B and B's addressee have just been discussing the proposition that B has the appointment. Otherwise, the utterances A and B_3 are to be interpreted as though they had taken place immediately in that context, whenever it actually occurred, an instance of accommodation.[6]

In (16), use of *too* in C's response C_1 favors accommodation of the proposition that Harold is a thief as a discourse topic prior to the utterance of (16B). In (17), being in the scope of negation in the second sentence seems generally to force accommodation of the referent to in focus cognitive status. In Hegarty (2003), it is noted that reference with *it* in the context of (17) is not so good if it is not within the scope of negation.

(20) a. Susan's boyfriend has graduated. Sally, who believes #**it**, is planning a party.

b. Susan's boyfriend has graduated. Sally, who believes **this**, is planning a party. Sarah, who doesn't believe it, refuses to help plan the party.

This suggests that (17) facilitates use of *it* by signaling or providing clues that the proposition is not, in fact, being introduced to the discourse. In particular, the negation in the context *does not believe* favors or accommodates a standing discourse-oldness of the propositional content of the complement of *believe*. A proposition which is discourse-old, and not just newly introduced, can be in focus, as shown by (15C) and the second sentence of (14B).

In these examples, the utterance containing the anaphor also contains some element (*too* or negation) which favors accommodation of the referent of the anaphor to discourse-old status. This permits a proposition newly introduced by a clause to be in focus, contrary to the usual pattern. But this doesn't account for (16C_2) or (18). To clarify the pattern exhibited by these remaining examples, consider another variant of (17), shown in (21).

(21) A: Susan's boyfriend has graduated.
B_1: I doubt **that / #it**; he doesn't have very many credit hours.
B_2: I don't doubt **it**; he has a lot of credit hours.

Along similar lines, recall (18), and consider the contrast between (22) and (23).

(22) A: What does John think of Mary?
B: John believes [that Mary is a genius]$_i$. And Fred proved it$_i$ / #that$_i$.

(23) A: What does John think of Mary?
B: John believes [that Mary is a genius]$_i$. But Fred disproved #it$_i$ / that$_i$.

[6]This formulation of the explanation differs somewhat from that given by Gundel et al. (1999), but it uses their essential ideas.

Note that, in (22), *that* would more naturally refer to the proposition that John has the stated belief, that Mary is a genius, and is infelicitous in referring to the propositional content of that belief, whereas in (23), *that* refers most felicitously to the proposition that Mary is a genius.

These examples exhibit a mix of facilitators and non-facilitators for use of *it* shown in (24), where x is the pronominal anaphor, and φ provides supporting evidence for the proposition referred to by x, as in (16C$_2$).

(24)

facilitators	non-facilitators
know x	believe x
be certain of x	think x
x be true: φ	say x
prove x	disprove x
don't doubt x	doubt x

The property distinguishing the facilitating contexts from the non-facilitating ones is not the factivity of the predicate since the context *be certain of x* is not factive in x: the speaker need not believe that the propositional content of the referent of x is true. (For example, the speaker of (18) need not believe that Mary is a genius.) Another characterization of the facilitating contexts to consider is that they involve Cattell's (1978) response-stance and non-stance verbs, which favor a context in which a designated (clausal) argument denotes discourse-old propositional content. But this can't be the distinguishing property since *disprove* and *doubt* are as response-stance and non-stance (respectively) in their complements as *prove* and *don't doubt*. In addition, response-stance *agree* doesn't pattern with the facilitators, as (25) shows.

(25) A: What does John think of Mary?
B: John believes $[$that Mary is a genius$]_i$. And I agree with that$_i$ / #it$_i$.

The property at issue seems, instead, to be best characterized as follows: the facilitating contexts in (24) are all ones which confer a higher epistemic status on the propositional content of the referent of x than it had prior to the utterance containing the anaphor. In this way, these contexts exhibit a positive epistemic gradient (+EG). Their effect on anaphoric pronouns is recorded in (26).

(26) *Positive Epistemic Gradient – 1*
Immediate pronominal reference to a new clausally introduced proposition is facilitated when the anaphor occurs in a context which increases the epistemic status of the proposition.

In light of the relationship between the felicity of the anaphoric expression and the cognitive status of the referent signaled by the expression, this condition can be recast as an effect of the contexts in (24) on the cognitive status of the propositional content of the referent of x, as in (27).

(27) *Positive Epistemic Gradient – 2*
A new clausally introduced proposition is accommodated to in focus cognitive status upon immediate anaphoric reference to it when the anaphor appears in a context which increases the epistemic status of the proposition.

The +EG contexts in (24) confer a higher epistemic status on the referent of x than it had before the context was processed. In a field of activated entities, a proposition whose epistemic status increases is promoted to in focus cognitive status over ones whose epistemic status diminishes or holds constant, presumably because a proposition is more salient if it is more likely to be true, everything else being equal. Accommodation is involved since the in focus cognitive status is conferred retroactively: the propositional content is regarded not only as in focus at the end of processing of the +EG context, but as having been in focus immediately prior to processing of the +EG context.

Further support for the +EG effect comes from (28) below. Keeping in mind that *it* is not particularly felicitous in examples like (15B), we nevertheless get a contrast between the two B responses in (28) (the response in B_2 is even less felicitous than the response in B_1), where the difference in longevity of Fred's claim makes a difference in the felicity of *it*, because the long-standing claim lends higher epistemic status to the proposition.

(28) A: John believes $[$that Alex is a genius$]_i$.
B_1: #Fred said it$_i$ years ago.
B_2: ##Fred said it$_i$ a moment ago.

In summary, a proposition or fact newly introduced by a clause can be accommodated to discourse-old status when referred to by an anaphor which is accompanied by particles such as *too* or negation, or referred to by an anaphor in a +EG context. The factive argument position of a factive predicate works both ways: it accommodates the propositional content of the referent to discourse-old status, and it is a +EG context. But not all +EG contexts are factive.

The discussion of this section shows that the cognitive status of a clausally introduced proposition or fact can be raised by various special conditions, including the newly identified effects of contexts with a positive epistemic gradient. But these conditions are identifiable and determinate special conditions, and when we factor out their effects, we are left with the basic pattern for immediate pronominal reference to clausally introduced propositions and facts observed in section 1 and in (14)–(15). This basic pattern was given a DRT-based explanation in (11). In the next section, we see that some parallel semantic facts have a more fine-grained, type-theoretic explanation in the model theory. Pursuit of the type-theoretic account in section 3 will provide us with an independent diagnostic of the discourse status of propositions and facts at a given stage in a discourse. This will provide independent support for the DRT accounts sketched in section 1, and in particular, it will clarify the status of clausally-introduced propositions and facts upon subsequent anaphoric reference.

3 Quantity adverbs

Quantity adverbs such as *mostly*, *partly*, and *for the most part* can be interpreted as mass quantifiers over part-whole structures, as discussed by Lahiri (2000, 2002) in connection with interrogative complements. In order to bring quantity adverbs into play with clausally introduced propositions, facts and events, we first need to identify the mass quantifying interpretation of these adverbs over linguistically introduced part-whole structure, and distinguish it from other interpretations of these quantifiers. To do this, consider the sentence in (29B), where the mass noun *sugar* introduces the part-whole structure of masses, generating an interpretation on which the greater part, or bulk, of what was loaded onto the truck was sugar.

(29) A: What did you load onto the truck?
B: Mostly, we loaded sugar onto the truck.

The mass noun *sugar* introduces a mass domain, and the quantity adverb can be naturally interpreted as a quantifier over that domain. The quantity adverb is sensitive to the information structure of the sentence on the occasion of use: focal material is mapped to the scope of the quantificational adverb, and non-focal material is mapped to its restrictor. For (29B), in the context of (29A), this yields the tripartite structure of quantification given in (30), with x a variable over mass elements.[7]

(30) [most x: we loaded x onto the truck] sugar(x)

Following Lahiri (2000, 2002), quantity adverbs are quantifiers over a mass domain structured as a Boolean algebra, $M = \langle A, \otimes, \oplus, \sim \rangle$, where, for $x, y \in A$, $x \otimes y$ is the element of A consisting of material common to x and y; $x \oplus y$ is the element of A consisting of all material in x together with all material in y; and $\sim x$ is the complement of x within A. The mass quantifier interpretation of *most* is given in (31), where μ is a measure defined on A, and $\text{Ext}_M(\alpha)$ and $\text{Ext}_M(\beta)$ are the extensions of the predicates α and β on A.[8]

(31) [most: α] β = T iff $\mu[\text{Ext}_M(\alpha) \otimes \text{Ext}_M(\beta)] > \mu[\text{Ext}_M(\alpha) \otimes \sim \text{Ext}_M(\beta)]$

From (30), this directly produces the mass quantifying interpretation of (29B) described above, provided the measure μ employed answers to our intuitions about the quantity or bulk of stuff loaded which was sugar, relative to the quantity or bulk of stuff loaded which wasn't sugar. A similar interpretation is made available in (32B) below by the mass-like behavior of plurals. The singular count noun in (33B) does not introduce such a mass-like structure, and as a result, (33B) does not felicitously mean that the piano constituted the greater part, or amount, of what was loaded onto the truck.

(32) A: What did you load onto the truck?
B: Mostly, we loaded pianos onto the truck.

(33) A: What did you load onto the truck?
B: ?#Mostly, we loaded the piano onto the truck.

In isolation, (33B) would more naturally mean that the greater part of the time spent loading the truck was spent on the piano, in which case *mostly* would quantify over an implicit domain of time with a suitable part-whole structure, or it could mean that the greater part of a given quantity of work we did consisted of the work of loading the piano onto the truck. But the question in (33A) favors an interpretation of the quantifier as quantifying over the quantity of material loaded, and (33B) is not felicitous with this interpretation.[9] The distinctions are subtle, but

[7] See von Fintel (2003) and Herburger (2000) for the role of pragmatic context and information structure in separating the restrictor from the scope of a quantificational sentence.

[8] $\text{Ext}_M(\alpha)$ is an element of A, specifically, the sum (under $\oplus$) of all elements of A to which α applies truly; similarly for $\text{Ext}_M(\beta)$

[9] Somewhat more marginally, (33A) might be interpreted as asking how the space in the truck was used, and (33B) as answering that most of the space was taken up by the piano. But on this interpretation, *mostly* is deflected to quantifying over space in the truck rather than over the quantity of loaded material.

robust. The referent of a singular count noun can be associated in various ways with the greater part of a given allotment of time, work, value, or expense in the interpretation of a sentence like (33B), but it does not introduce a mass-like part-whole structure on which it designates a part which constitutes the greater amount of mass or material being talked about, as the mass noun and plural do in (29) and (32).

To get one step closer to the target sentences of this section, (34a) admits a mass-quantifying interpretation on which the greater number of things Alex believes, or, depending on the focus structure of the sentence, the greater number of stories he believes, are Jill's stories.

(34) a. Mostly, Alex believes Jill's stories.

b. Mostly, Alex believes Jill's story.

But (34b) does not admit a mass-quantifying interpretation on which the greater number of things or stories Alex believes are to be identified with Jill's one story. The only natural interpretation of (34b) is that, of relevant stories (or relevant objects of belief) which Alex believes, Alex believes Jill's story to the greatest degree. On this interpretation, *mostly* quantifies over a scale of degrees of belief, rather than over a mass-like part-whole structure.

With these preliminaries, we can turn to the interaction of quantity adverbs with clausally introduced propositions and facts. In (35), B's utterance admits an interpretation on which the proposition that the university has gone too far in adopting a corporate management model characterizes most of what Alex believes about the university; that is, the greater quantity, or greater part, of Alex's beliefs about the university consist of, or reduce to, the proposition that the university has gone too far in adopting a corporate management model.

(35) A: What does Alex think about the university?
B: Mostly, Alex believes that the university has gone too far in adopting a corporate management model.

The interpretation described above is what (31) should produce from the tripartite structure in (36). (How to construe clausally introduced propositions, and the measure μ, in order for (31) to yield this result from (36) is discussed later in this section.)

(36) [most x: Alex believes x about the university] [that the university has gone too far in adopting a corporate management model (x)]

Contrast this with the result when a complex nominal appears in place of the clausal complement, as in (37).

(37) A: What does Alex think about the university?
B: Mostly, Alex believes the proposition Jill believes.

In a context in which A can assume that the proposition Jill believes is a uniquely identifiable proposition about the state of the university, (37B) would most naturally mean that, among Alex's beliefs about the university, the proposition Jill believes is the one he believes to the greatest degree. It does not mean that the proposition that Jill believes characterizes most of what Alex believes about the university. And it would be odd to say that the one proposition Jill believes constitutes the bulk of what Alex believes about the university. Thus, propositions introduced by

nominals do not support the mass quantifying interpretation of quantity adverbs in the way that propositions introduced by clauses do. A similar distinction is obtained for fact-denoting clauses and nominals.

Turning to events, in (38) below, with option (a.) for the witness's answer, the answer introduces a set of events which can be regarded as making up most of what happened in the room between 4:00 and 4:05. This might be regarded as a sum of the events of individual children running about the room. In contrast, the alternate answer (b.) introduces a single event, and can be interpreted as asserting that this event is the most important event which transpired in the circumstances, but not that it makes up the bulk of what transpired.

(38) Detective: What happened in this room between 4:00 pm and 4:05 pm?
Witness: a. Mostly, children were running about the room.
b. Mostly, Max spilled his martini on the ambassador.

Thus, a single proposition or fact introduced by a clause can serve as the part in a part-whole structure supporting a mass-quantifier interpretation of a quantity adverb, on which the part constitutes the bulk of the whole. A single event introduced by a clause, or a singular individual introduced by a nominal, does not enter into a mass-like part-whole structure supporting a mass quantifier interpretation of a quantity adverb.

These facts have implications for the semantic type of clausally introduced propositions and facts. The standard semantic type of a proposition p is $\langle s,t\rangle$, which corresponds to a set of possible worlds, $W(p)$, the worlds in which p is true. Unfortunately, the reasonable choices for the set of possible worlds corresponding to the restrictor in (36) lead to unworkable truth conditions for (35B) under the interpretation of the quantity adverb given in (31).[10] To see this, let $\{p_i\}_{i\in I}$, for an index set I, be the set of propositions constituting Alex's beliefs about the university, and let $p_k(k \in I)$ be the proposition that the university has gone too far in adopting a corporate management model. To apply (31) in this context, let μ be set cardinality. A restrictive choice for the set of possible worlds for the restrictor in (36), screening out inconsistencies in Alex's beliefs, would be $\cap_{i\in I}W(p_i)$. But in this case, the condition in (31) reduces to the claim that most of the worlds in $[\cap_{i\in I}W(p_i)]$ are also in $W(p_k)$, which is vacuously true since $[\cap_{i\in I}W(p_i)] \subseteq W(p_k)$. A more expansive choice for the set of possible worlds for the restrictor in (36), and the only other salient choice, would be $\cup_{i\in I}W(p_i)$, the union of sets of worlds corresponding to Alex's beliefs about the university, without regard for consistency. This leads to the condition in (39), where $\sim W(p_k)$ is the complement of the set of worlds in which p_k holds. Since $k \in I$, (39) reduces to (40).

(39) $\mu[\cup_{i\in I}W(p_i) \cap W(p_k)] > \mu[\cup_{i\in I}W(p_i) \cap \sim W(p_k)]$

(40) $\mu[W(p_k)] > \mu[\cup_{i\in I}W(p_i) \cap \sim W(p_k)]$

This condition is subject to a form of the proportion problem. Suppose that most of the propositions p_i are quite restrictive, such that $W(p_i)$ is quite small, and these are the ones which are reducible to p_k, so that p_k holds of all the worlds in $W(p_i)$. But suppose that there is a proposition p_n (for some $n \in I$, $n \neq k$) which is quite general and weak (e.g., "The university is supposed

[10]This discussion follows Hegarty (2003) up to a point, but a substantially different account of the interpretation of (35B) is ultimately proposed here.

to be devoted to the selfless pursuit of knowledge"), so that $W(p_n)$ is large compared to $W(p_k)$, and suppose that p_k is false for most worlds in $W(p_n)$. Then the condition in (40) would fail to hold even if (35B) were true.

The problem with (39)–(40) as the interpretation of a sentence such as (35B) is that (35B) doesn't fundamentally mean that the set of worlds in which p_k is true is large compared to some other set of worlds. What (35B) means is that p_k has a set of rich contextually-based entailments which encompass most of what Alex believes about the situation at hand. This suggests that the condition in (31) be evaluated on sets of entailments, rather than on sets of possible worlds.

This motivates raising the type of propositions to type $\langle\langle s,t\rangle,t\rangle$ when they are introduced by a clause. To implement this, let $\wp = \langle P, \wedge, \vee, \neg\rangle$ be the standard Boolean algebra on propositions, defined in terms of the connectives of propositional logic, and define a partial linear ordering $\leq$ on P in terms of entailment: for $p, q \in P$, $p \leq q$ iff $p \rightarrow q$. Given a clause α, and the proposition p recovered directly from the predicate-argument and quantificational structure of α, let the denotation of α be the principal ultrafilter F_p generated by p under the partial order, $\leq$.[11]

(41) $[\![\alpha]\!] = F_p = \{r : p \leq r\}$.

To illustrate the import of this proposal, consider the examples in (1a) and (3a), repeated here in (42). (The example in (42b) involves a fact-denoting expression, not a proposition-denoting expression, but the proposal in (41) holds for facts as well as for propositions.)

(42) a. For more sophisticated [mathematical] ideas, it is necessary to study the cognitive mechanisms that characterize mathematical concepts. Lakoff and Nuñez argue that these are the same ones that characterize ordinary ideas. **This** leads to the authors' main thesis – that mathematics develops by means of metaphors. (Auslander, Joseph. 2001. *American Scientist* 89:366.)

b. "We believe her, the court does not, and **that** resolves the matter," Mr. Montanarelli said today of Ms. Lewinsky's testimony that she had an independent recollection of the date. (*New York Times*, May 24, 2000)

In (42a), the proposition introduced by the clausal complement of *argue* is claimed by the last sentence to lead to the author's main thesis. According to the interpretation of this clause in (41), it is not the base proposition alone which leads to the author's main thesis, but the base proposition together with its contextual ramifications. Likewise, according to (41), the resolution alluded to in (42b) is effected not by the base fact recovered from *we believe her, the court does not*, but from the principle ultrafilter, which includes not only this base fact, but its ramifications in the context of utterance. Most likely, it is ramifications of this fact, concerning the divergence in opinion between "we" and the court, or the court's failure to accept Ms. Lewinsky's testimony, which directly resolves the matter, rather than the base fact itself. These interpretive consequences in (42a,b) are obtained explicitly under (41) since the ramifications which lead to the author's main thesis in (42a), and which resolve the matter alluded to in (42b), are, in each

[11] More generally, a filter in P is a non-empty set $F \subseteq P$ such that,

a. if $p, q \in F$, then $p \wedge q \in F$;

b. if $p \in F$ and $q \in P$, and $p \leq q$ then $q \in F$.

example, members of the denotation under (41) of the clausal antecedent of the demonstrative pronoun. These observations by themselves constitute only a weak argument for (41) since the inferential connections required between the denotation of *this* and the author's main thesis in (42a), and between the denotation of *that* and the resolution of the matter in (42b), could be established with the base proposition as the denotation of the antecedent clause in both examples, relying then on a longer chain of inference through contextual assumptions to the desired entailments. But these examples illustrate the idea behind (41). More compelling arguments for (41) are based on the fact that it alone yields correct interpretations of sentences with coordination of clauses introducing propositions and facts (see Hegarty 2003), and of sentences in which such clauses appear in the scope of quantity adverbs, to which we now return.

The interpretation in (41) yields a realistic account of quantity adverb interpretation over clausally introduced propositions and facts. By way of illustration, return to (35B). As before, let $\{p_i\}_{i\in I}$ be the set of Alex's beliefs about the university. Let $p_k(k \in I)$ be the generating proposition for the denotation of the *that*-clause complement; that is, p_k is recovered directly from the predicate-argument structure of the *that*-clause complement in (35B), and F_{pk} is the denotation of the *that*-clause, as given in (41). Note that much of F_{pk} is irrelevant to Alex's belief state. For example, for any proposition $q, p_k \vee q \in F_{pk}$, even if Alex, due to a lack of relevant knowledge or acumen, cannot possibly comprehend q. But such a proposition $p_k \vee q$ is not a belief of Alex. Likewise, F_{pk} contains all tautologies, including ones which Alex has never entertained and could not possibly understand. The belief context in (35B) effectively restricts F_{pk} to a subset consisting of those of its members which are beliefs of Alex. Let $B(a, F_{pk})$ be the set of members of F_{pk} which are beliefs of Alex, and note that $B(a, F_{pk}) \subseteq \{p_i\}_{i\in I}$. With this notation in hand, (35B), interpreted as specified in (36), asserts that $\{p_i\}_{i\in I}$ consists mostly of members of $B(a, F_{pk})$, as expressed in (43) (with μ measuring set cardinality).

(43) $\mu[\{p_i\}_{i\in I} \cap B(a, F_{pk})] > \mu[\{p_i\}_{i\in I} \cap {\sim}B(a, F_{pk})]$

Since $B(a, F_{pk}) \subseteq \{p_i\}_{i\in I}$, this reduces to (44).

(44) $\mu[B(a, F_{pk})] > \mu[\{p_i\}_{i\in I} \cap {\sim}B(a, F_{pk})]$

This expresses the condition that more of Alex's beliefs about the university stem from p_k than not, that is, the beliefs of Alex about the university which are expressed by the subordinate clause in (35B) outnumber those of his beliefs about the university which are not expressed by this clause. This interpretation does not fall victim to the proportion problem in the event that one of the p_n (for some $n \in I, n \neq k$) is quite general and weak (e.g., "The university is supposed to be devoted to the selfless pursuit of knowledge"). In such a case, assuming p_n is not in $B(a, F_{pk})$, p_n counts as one, and only one, proposition contributing to the tally on the right hand side of (44); it does not spawn a large set of possible worlds, or any other large set, which would subvert the interpretation of (35B). In fact, (44) quite directly reflects the correct interpretation of (35B) in the context of (35A): that most of Alex's beliefs about the university are ones expressed by the complement clause (specifically, those of his beliefs which are generated by a base proposition associated with the complement clause). This is a more realistic interpretation of (35B) than could be obtained under the type $\langle s, t\rangle$ for clausally introduced propositions.

In this section, it was shown that clausally introduced propositions and facts have the semantic type $\langle\langle s, t\rangle, t\rangle$, and that as a result they can undergo mass quantification by quantity adverbs, in a way which propositions and facts introduced by nominals cannot.

4 Type change of entities in discourse

In section 1, it was noted that the failure of clauses to render propositions and facts in focus, and therefore available for immediate anaphoric reference with *it*, cannot be attributed to the lack of syntactic prominence of clauses relative to NP arguments in prominent syntactic positions, since eventualities introduced by clauses with no greater syntactic prominence than the ones introducing propositions and facts can be rendered in focus. Other possible explanations, based on a lack of cognitive accessibility for clausally introduced propositions and facts, can be equally well discarded. For example, we might suppose that clausally introduced propositions and facts fail to attain in focus cognitive status due to a lack of spatio-temporal delimitation. But this must be rejected since propositions introduced by a nominal in (5), and propositions after a second mention in a discourse in (1b)–(4b), lack spatiotemporal bounds, yet are in focus.

The interpretation of clausally introduced propositions and facts as principle ultrafilters, proposed in section 3, suggests another initially attractive hypothesis: that in focus status requires that participants in a discourse have attained a degree of comprehension of the in focus entity which cannot be attained for clausally introduced propositions and facts. The idea can be sketched as follows. The interpretation of a clause as a principal ultrafilter must be wielded in a psychologically plausible way. If *Alex believes* β, where β is interpreted as F_p, then some of the entailments in F_p will be cognitively accessible to Alex, and some will not be. From *Alex believes* β, uttered in a context C, it certainly doesn't follow that Alex automatically believes all entailments of p in C; it can only mean that he believes the generating proposition and those entailments which are cognitively accessible to him. As a result, there is a grading off in ramifications: if Alex believes that Bill stole the artifact in a context C, it follows that he believes the artifact was stolen, but he may not realize that Bill could not have stolen the artifact without Mary's help, even if this necessarily follows within C. Perhaps the clausally introduced proposition or fact is not rendered in focus since it can only be partially comprehended.

But this hypothesis is also wrong. A shadowy individual, about whom the participants in a discourse know little, can be in focus, and referred to with a personal pronoun. Furthermore, further mention with a nominal expression does not make the principal ultrafilter F_p of a proposition or fact become more fully comprehensible or psychologically accessible, yet such further mention renders the referent in focus, as in (1)–(4) and (14)–(15).

Thus, the most straightforward hypotheses positing a connection between the cognitive status of the referent and the syntactic prominence of the expression, or between cognitive status and pretheoretically conceived notions of the comprehensibility or cognitive accessibility of the referent, do not explain the observations made in section 1.

In this context, we can appeal to the distinctive semantic type of clausally introduced propositions and facts, drawing a correlation between the semantic type and the cognitive status of the referent, and hope to discover explanatory value in that correlation. Adopting the type-theoretic proposals of section 3, the results in section 1 can be summed up in the following observation, a refinement of (11) in section 1.

(45) Only entities with type e in the model can be in focus.

That is, only elements of type e are admitted into the center of attention. Higher typed entities, even if introduced in prominent syntactic positions, are not admitted to the center of attention. In (1)–(4) and (14)–(15), use of *that* for anaphoric reference effects a type update: the type of the proposition or fact, $\langle\langle s, t\rangle, t\rangle$, changes to type e upon use of *that* to refer to the proposition

or fact. Since the proposition or fact is in short-term memory and at the center of attention, it is rendered in focus upon type change to type e.

How does this downward type-shifting work? It won't do to take the generating member of the ultrafilter as the downward shifted type since the generator is already of higher type than e, specifically, of type $\langle s, t\rangle$ for propositions and facts. Note that for propositions and facts, type-shifting can't even be construed as type-lowering since the higher type doesn't contain e. Instead, a new elementary individual of the discourse is created, of type e. This can be construed as a peg, in the sense of Landman (1986) – a discourse representation which exists solely as a locus of predication, and which has no identity conditions aside from predicates ascribed to it in the discourse. For clarity, we will refer to pegs as discourse pegs.

At this point, we are in a position to provide independent support for Asher's (1993) proposal that the subDRS of a clausally-introduced proposition or fact is, upon further nominal reference, construed with a first-order variable in the domain of the DRS. As discussed above, the model-theoretic correlate of this DRT operation is downward type-shifting from type $\langle\langle s, t\rangle, t\rangle$ to type e. If downward type-shifting upon further mention is correct, it should be revealed by a post-type-shift failure of the diagnostics used to detect higher types. It has already been observed that further mention permits subsequent reference with a personal pronoun. But the discussion of section 3 showed that the availability of the mass-quantifying interpretation of a quantity adverb is an independent diagnostic of semantic type for a proposition or fact denoted by a constituent in the scope of the adverb. Furthermore, we know why this diagnostic works: only propositions and facts of type $\langle\langle s, t\rangle, t\rangle$ support the mass-quantifying interpretation of a quantity adverb. Applying this diagnostic to propositions and facts which have been introduced by a clause and then mentioned again using a nominal expression, we obtain evidence for downward type-shifting. Consider A's rejoinder to B in (46).

(46) A: What does Alex think about the university?
B: Mostly, Alex believes that the university has gone too far in adopting a corporate management model.
A: Mostly, Sam believes that too. / Sam mostly believes that too.

In B's response, *mostly* can quantify over the body of Alex's beliefs about the university; this yields an interpretation of (46B) as asserting that the greater part of Alex's beliefs pertaining to the university can be summed up in the proposition that the university has gone too far in adopting a corporate management model, and its ramifications. But in A's rejoinder, *mostly* can only modify the intensity, certainty, or degree of Sam's belief. It can't assert that the greater part of Sam's beliefs about the university are summed up in the proposition referred to by *that*. This shows that pronominal reference with *that* to the proposition introduced by the complement clause in (46B) immediately shifts the type of this proposition to some type other than $\langle\langle s, t\rangle, t\rangle$, rendering it unsuitable for the scope of the quantity adverb interpreted as a mass quantifier, in A's rejoinder. Furthermore, it can be observed that expressions denoting propositions or facts which have been type-shifted downward show another diagnostic of type e: they coordinate as a plural, rather than as a singular sum. (See Hegarty 2003 for evidence that propositions and facts of the raised type, $\langle\langle s, t\rangle, t\rangle$, coordinate as a singular sum; see Moltmann 1997 for similar facts, and McCloskey 1991 for related facts.) Contrast (47) below with (48).

(47) Alex believes that Tom stole the personnel files and that Susan embezzled the funds. Marsha believes that / ?#those too.

(48) Alex believes that Tom stole the personnel files and that Susan embezzled the funds. This claim about Tom and the claim about Susan have been reported to the president.

a. They are likely to be true. b. #It is likely to be true.

In (47), the coordination of subordinate clauses can be more readily interpreted as denoting a single, more complex proposition, supporting singular anaphoric reference with *that*, than as a plural.[12] In (48), following the introduction of the two propositions, subsequent coordination of nominals denoting these propositions does not set up reference to a singular sum: *it* in (48b) cannot refer to the complex proposition that Tom stole the files and Susan embezzled the funds. Thus, further reference with a nominal shifts the type of a clausally-introduced proposition or fact downward from type $\langle\langle s,t\rangle,t\rangle$ to type e.

The condition in (45) expresses a correlation between cognitive status defined on the Givenness Hierarchy and semantic type. Does this correlation have a principled basis, and does it have explanatory value? An attempt to answer this in the affirmative by appealing to limited comprehensibility of referents of higher semantic type has already been rejected above. The idea behind that attempt was that referents of higher semantic types have lower cognitive accessibility, resulting in lower referential accessibility. But this was not sustainable. An alternative perspective on (45) is that it reflects a positive condition on what can be in focus, not a negative condition on what can't be in focus; specifically, that, among entities introduced linguistically into a discourse, attention can be focused only on discourse pegs. This is clearly not a condition on attentional focus *per se* since one can focus attention on any object present in the environment or called up in memory, without any discourse constraints. But in focus status in discourse is different: it must be socially recognized, attributed to addressees by speakers and writers. When it is apparent to a speaker that an object is at the center of the addressee's attention, reference with a personal pronoun is possible even in the absence of an antecedently existing discourse peg. But for linguistically introduced entities, the conditions which assure that an entity is at the center of addressee attention are necessarily more abstract. One interpretation of the hypothesis expressed in (45) is that it amounts to the claim that a necessary condition for a linguistically introduced entity to be at the center of addressee attention is for it to be a discourse peg with sufficient salience. Both parts of this condition are required since some discourse pegs are merely activated (e.g., for an entity which has been talked about, but hasn't been mentioned for a couple of sentences), and clausally introduced propositions and facts cannot be in focus, even when they are highly salient, until they have been reduced to discourse pegs.

Following downward type-shifting upon subsequent nominal reference to a clausally-introduced proposition or fact, the higher type $\langle\langle s,t\rangle,t\rangle$ is no longer accessible, as (46) and (48) show. Subsequent statements such as, *I believe it*, with *it* referring to a clausally-introduced proposition, are interpreted on a par with, *I believe that story*, which involves reference to an avowedly first order entity as the object of belief.

5 Conclusion

The pronominal reference facts can be expressed within DRT: a clausally introduced proposition or fact is represented as a subDRS, and with subsequent nominal mention, the subDRS is replaced

[12] A plural anaphor is not entirely excluded in (47) since the plural demonstrative NP *those propositions* is fine in this context. The point here is that the singular pronominal anaphor is so much more felicitous in (47) than in (48).

with an individual variable. Observing differences in the availability of the mass quantifying interpretation of quantity adverbs when clauses versus nominals appear in their scope introducing propositions or facts, it was shown that the subDRS maps to an entity of type $\langle\langle s,t\rangle,t\rangle$ in the model theory of the discourse, while individual variables map to elements of type e. The transition from a subDRS to an individual variable therefore corresponds in the model theory to a semantic type-shift from type $\langle\langle s,t\rangle,t\rangle$ to type e. Thus, there exist parallel accounts of discourse properties of propositions and facts within DRT and within the model-theoretic interpretation. This provides independent support for the DRT account of the discourse properties. More generally, it shows that properties of propositions and facts in discourse flow partly from the structure of discourse, and partly from a dynamic conception of the underlying semantic ontology.

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THE HIDDEN PATH OF SEMANTIC CONTENT WITHIN PRAGMATIC CONTEXT: A FREQUENCY STUDY OF THE DEFINITE ARTICLE *the*

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1 Introduction

This paper argues that the semantics of a noun can determine its likelihood of occurring with the definite article *the* in English. It presents a set of results from corpus analysis and web-search data, illustrating that some noun phrases being formally definite in discourse is the result not only of the pragmatic contexts involved, but also of their semantic contents.

Many scholars who have studied the article *the* in English have followed a pragmatic and perhaps anaphorically-oriented approach, emphasizing that the use of the construction is primarily "discourse-driven" and predominantly "anaphoric" in nature. Some approaches radiating from this perspective include: the notions of "identifiability", "familiarity" and "givenness" (e.g., Gundel et al. 1993, 2001; Gundel 1996; Chafe 1976; Prince 1981, 1992); the mechanism of "bridging inferences" (e.g., Haviland & Clark 1974; Clark 1977); the theory of "common ground" (e.g., Clark 1992); the hypothesis of "relevance" (e.g., Matsui 1998; Sperber & Wilson 1995), and the effect of "accessibility" (e.g., Ariel 1988).

A handful of researchers, however, have introduced a stronger semantic perspective to the issue. Löbner (1985) argues that some nouns are "definite" simply because they are semantically so. Fraurud (1996) also reported that the ontological properties of a referent might make it more likely to occur in an antecedent-less definite noun phrase. There are also increasing amounts of evidence, from other researchers, showing that antecedent-less, or non-anaphoric, definite noun phrases are common in natural discourse (Gundel et al. 2001; Poesio & Vieira 1998).

This paper focuses on issues that are of concern to a semantic approach to definiteness. Instead of finding out how pragmatic properties contribute to definiteness and focusing on the search of default antecedents, it studies the semantic properties of head nouns, to see what would contribute to definite encoding. I first present an analysis of 1417 definite noun phrases found in a corpus of 28203 words to show that non-anaphoric, or antecedent-less, definite NPs are common in natural discourse. Ontological knowledge is often needed for referent resolution. I then report the results of a second study, demonstrating that some lexical items are indeed more likely to be definite when compared to others, due to the specific traits of their semantic contents.

2 Background

The use of the article *the* in English has been regarded as "pragmatic" and "anaphoric" in many linguistic descriptions. Although some studies point out that certain semantic relationships, e.g., the part-whole relationship, may be used by the hearer to identify definite referents (e.g., Hawkins 1978; Erku & Gundel 1987; Prince 1981), definiteness has been discussed primarily as a general pragmatic mechanism, rather than one that could be lexically specific to the words being used. This view of definiteness assumes that the use of the article is primarily a "discourse-driven" process, and the resolution of its referent is often "anaphoric" or "referential" in nature. It suggests that a definite noun phrase refers to entities that are somehow presumed by the speaker to exist in a contextual venue shared by the speech participants. It thus explains the resolution of definite noun phrases, even the antecedent-less ones, in terms of "antecedent-searching": the hearer needs to find or to establish an antecedent in the shared venue, and then to co-specify it with the referent. This anaphoric perspective of definiteness has been the "backbone" of many approaches. I shall review some authors' work, in which this view has been most overtly illustrated.

2.1 The use of *the* as an Anaphoric Phenomenon

2.1.1 The Theory of "shared set" and "common ground"

The anaphoric view of definiteness has been overtly expressed in the description provided in some early studies. For example, Hawkins (1978) stated that the use of a definite article is a performance of three speech acts. The speaker "introduces a referent" denoted by the article, "instructs the hearer to locate the referent in some shared set of objects", anaphorically and "refers to the totality of the objects or mass within that shared set" (Hawkins 1978:67).

Similar to the idea of Shared Set presented by Hawkins (1978), Clark (1992) and Clark & Marshall (1981) described the resolution of a definite referent as a process in which the addressee would find the intended referent in the common ground shared by the speech participants. They explained why a definite noun phrase could be used, even when there isn't an explicit antecedent in the text, for example, in (1), where the antecedent of the definite referent is not explicitly mentioned:

(1) I bought a candle yesterday, but the wick had broken off.

They said that, in this case, an "Indirect Linguistic Copresence" of the referent "wick" with the participants is established in the first sentence pragmatically, through the mention of the candle alone. When the candle is mentioned, *the wick*, "the speaker", and "the addressee" all become linguistically "co-present" in the Common Ground.

> Imagine Ann saying to Bob I bought a candle yesterday, but the wick had broken off... To refer to the wick she has to assume that when Bob accepts the existence of the candle, he also accepts the existence of the wick. By referring to the wick, she can therefore secure mutual knowledge of the identity of the wick that belongs to this particular candle. Ann's use of a candle, then, establishes what we will call the indirect linguistic copresence of her, Bob, and the wick. (Clark 1992:41)

Clark and Marshall call this Indirect Linguistic Copresence of the referents. Since all three entities are co-present in the common ground, the *wick* is identifiable and can be definite. Thus,

in a nutshell, interpreting a definite referent means to look for an antecedent somewhere, whether it already has one or not.

2.1.2 Bridging Inference

Explicitly, the anaphoric nature of definiteness is also expressed in some psycholinguistic theories. For example, Clark (1977) hypothesized several steps for the process of definite noun phrases:

(2) Step 1: Compute the description of the intended referent.
Step 2: Search memory for an entity that fits this description and satisfies the criterion that the speaker could expect you to select it uniquely on the basis of this description. If successful, go to Step 4.
Step 3: Add the simplest assumption to memory that posits the existence of an entity that fits this description and satisfies the criterion that the speaker could expect you to select it uniquely on the basis of this description. If successful, go to Step 4.
Step 4: Identify this entity as the intended referent.

Clark and his colleagues also suggested that if the definite referent is mentioned only the first time, an association between the definite referent and its "implicit" antecedent is established with a process called Bridging Inference. This idea was formulated initially when Haviland & Clark (1974) measured the reading time of target sentences in two conditions (the target sentences are the second sentence of each pair):

(3) Direct Antecedent, e.g., *We got some beer out of the trunk. The beer was warm.*
Indirect Antecedent, e.g., *We checked the picnic supplies. The beer was warm.*

They suggested that when the antecedent is not explicitly mentioned in the second pair of sentences, the addressees could not find an activated matching "antecedent" in memory. They therefore needed to construct a "bridging assumption" to allow the "new" entities in the target sentences to be identified. That is why the reading time of the target sentence was longer in that second pair. This process is thus known as "Bridging Inference" or "Bridging" (Clark 1977; Haviland & Clark 1974).

2.1.3 Computational Model

Some computational models also emphasize the anaphoric aspect of definiteness. Sidner (1979, 1983a) suggested that one can find the default antecedent of a definite referent by various linguistic means (Sidner 1983b:269). She suggested that there are several ways to identify the default antecedent in various contexts (Sidner 1983a:114). First, the default choice is the "semantic object" or the "theme" of the verb in an initial sentence, such as the one in the above example. In other occasions, it could be the "theme" of a "*there*-insertion sentences" (e.g., *There once was a wise old king who lived on a mountain.*), marked by stress and prosodies (*I want one of JEREMY'S pictures*), or modified by the determiners *this* and *that* (*I talked with this lady in the credit department, but she didn't give me much help with my order*). Sometimes, the "case" of certain verbs could also indicate the antecedent status of an entity (e.g., *I got a really pretty turtle this week.*). Finally, the antecedent can also be "affirmed" by "knowledge associations", which is similar to the process of Bridging described by Clark.

Centering Theory is another approach employed by some researchers to resolve definite referent anaphorically. An example can be found in Grosz et al. (1983, 1995). They illustrate how Centering Theory and the rules could be applied to some nominal definite noun phrases:

(4) Have you seen the new toys the kids got this weekend?
Stuffed animals must really be out of fashion.
Susie prefers the green plastic tugboat to the teddy bear.
Tommy likes it better than the bear too, but only because the silly thing is bigger.

Centering Theory assumes that previously mentioned entities could be "ranked" (e.g., Subject $>$ Object2 $>$ Object $>$ others), to illustrate how likely it will be the antecedent of a later mentioned definite noun phrase (Walker & Prince 1996; Walker et al. 1998). In (4), Grosz et al. suggested that the entity *green plastic tugboat* in the last sentence is represented by a pronoun and is therefore the highest ranked antecedent candidate (i.e., Forward Looking Centering). It should therefore be the most likely coreferential candidate for the definite noun phrase *the silly thing*.

2.1.4 "Familiarity" and "Givenness"

Another way to look at definiteness pragmatically is to define the "familiarity" of a discourse referent, and assume that the speaker's choice of the linguistic form (to denote that referent) would depend on its familiarity status or discourse type. For example, Prince (1981, 1992) classified discourse entities into different types, based on how or whether they have been pragmatically established prior to their current mention (e.g., old to the hearer, new to the hearer, evoked previously in the text by explicit mention). Prince (1981) described three main classes of discourse referents, New entities, Evoked entities, and Inferrables. The taxonomy, including the subclasses of the three main classes, is presented in Figure 1.

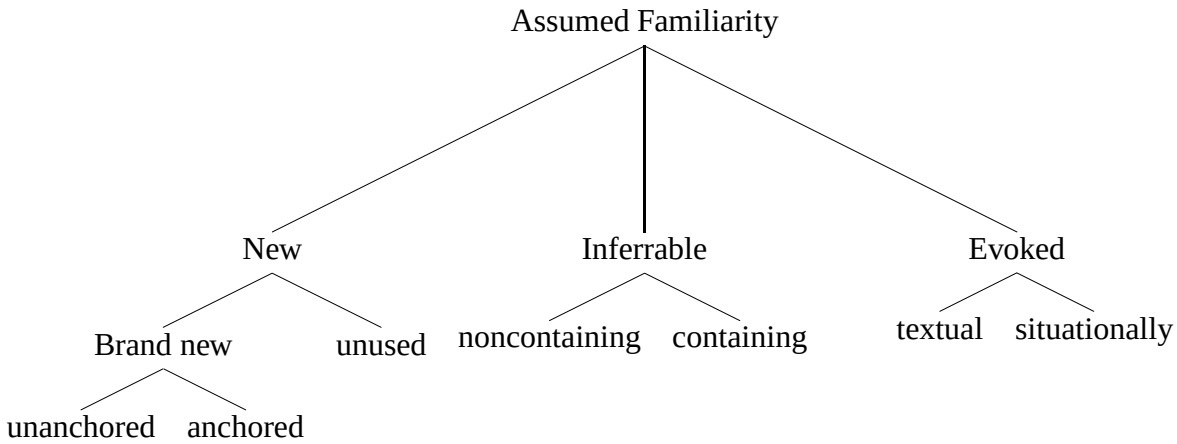

Figure 1: The Taxonomy of Familiarity (Prince 1981:237)

New entities are entities that the speaker introduces explicitly the first time in the discourse, and has few reasons to believe that they are in the hearer's mind at the speech moment. On the other hand, if the speaker believes that the entity has been somehow established previously and that the hearers should have its representation in their consciousness, it would be considered an

Evoked entity. The third category, Inferrables, receives an intermediate status between the status of Brand-new and Evoked. Inferrables refer to entities "that are not explicitly mentioned, but are somehow inferrable, through logic or reasoning, from other entities in the discourse". In the sentence, *I got on a bus yesterday and the driver was drunk*, the entity of the first mentioned definite NP, *the driver*, could be inferred from *a bus*.

Along a similar line, Gundel and her colleagues (Gundel et al. 1993) hypothesized a division of six cognitive statuses relevant to the form of referring expressions in natural discourse:

The Givenness Hierarchy (Gundel et al. 1993):

in focus	>	activated	>	familiar	>	uniquely identifiable	>	referential	>	type identifiable
(*it*)		(*that, this, this* N)		(*that* N)		(*the* N)		(*indefinite this* N)		(*a* N)

In this hierarchy, entities that are considered to be more familiar to the hearer would have a status located more to the left of the hierarchy, while the rightmost status (i.e., Type Identifiable) would categorize entities that are consider to be least familiar to the hearer. According to Gundel et al., a referent can be denoted by the article *the* appropriately, when it is at least uniquely identifiable to the hearer, which means that the referent can either exist in the addressee's memory or has enough descriptive content encoded in the noun phrase that denotes it (e.g., *the dog next dog*).

2.2 Semantic Definites and Pragmatic Definites

The observations of the uses of *the* we have discussed thus far have taken a perspective that the article is primarily an anaphoric construction. Some scholars, on the other hand, have offered a semantic perspective of the usage of *the* They propose that the semantics of a noun, not just the anaphoric contexts, can themselves be the source of definiteness that motivates the use of the article. For example, Löbner (1985) distinguished two types of definiteness, Semantic Definites and Pragmatic Definites. In general, Pragmatic Definites are noun phrases in which the use of the article *the* is more referential, and more related to the pragmatic contexts where the speech participants are situated. As Löbner described, Pragmatic Definites are "dependent on special situations and contexts for the non-ambiguity (and existence) of a referent" (Löbner 1985:298). Pragmatic Definites include the deictic, anaphoric, and endophoric uses of the definite article.

On the other hand, "Semantic Definites", unlike the Pragmatic ones, establish their referents independently from the immediate situation or context of utterance. Thus, they are not always discussed in an anaphoric model. They refer to referents with special semantic properties that contribute to unambiguous interpretations (Löbner 1985:298). They include proper names (e.g., *the People's Republic of China, the opera Rigoletto*), entities of single instances (e.g., *the weather, the time, the air, the moon*), superlatives, and definites with a "functional" head noun (e.g., *the wife of . . .*; *the clutch*). In sum, according to Löbner, "semantic definites refer unambiguously due to general constraints; pragmatic definites depend on the particular situation for unambiguous reference".

Löbner discussed examples of Inferrable (or Bridging) in terms of Semantic Definites. He suggested that what make their noun phrases definite is that they often have head nouns denoting "function" or "relational" concepts. For example, the concept of the noun *weight* would always

be used to describe the *weight* of something. The word *clutch* would always bring up the concept of "car" because it is always a part of a car. Thus, the (semantic) "functional argument" of these nouns (i.e., the thing that has the *weight*, the car of the *clutch*) is unambiguously available in the immediate linguistic context as part of the semantic property of the nouns themselves, rather than being generated by some pragmatic condition in advance. When this type of words is used with a definite article, the functional argument naturally serves to make the referent unambiguously definite.

2.3 The Ontological Properties of Definites

A similar idea has also been presented by Fraurud (1996). She suggested that there is a correlation between NP forms and different ontological classes of entities. It was pointed out that some ontological classes are more likely to be encoded with a definite form when compared to the others, despite their information status. In her corpus data in Swedish, non-human definite noun phrases that denote non-human entities are more likely to be "antecedent-less", when compared to those denoting human entities. Similar to Löbner's ideas of "Functional concept" and "Sortal concept", Fraurud distinguished three ontological classes that are relevant to NP encoding. They are "Individuals", "Instances", and "Functionals". "Individual" entities are conceived of in their own right. They are "directly identifiable" and are generally identified by the use of proper name. To identify a referent of this category through its noun phrase, readers will need to have previous knowledge of the referent (i.e., "token knowledge" Fraurud 1996:73). Thus, it is similar to what Prince (1992) classified as "hearer old, discourse new".

On the other hand, "Instances" are conceived of as instantiations of types (e.g., *a glass of wine*), which are typically referred to by means of indefinite NPs in their first mention. Finally, Functionals are usually conceived of only in relation to other entities or elements. They are identifiable indirectly through their anchors" (e.g., *his nose*, or *the nose*). To identify a Functional referent of a definite noun phrase, the hearer needs to have the "knowledge of possible associations between the entity and other entities". Fraurud calls this knowledge "relational knowledge" (1996:76).

3 Studying the Semantic Source of Definiteness

3.1 The Use of Quantitative Methods

In the previous section, I have reviewed some common approaches towards the study of definite expressions with *the*. Undoubtedly, all the approaches have provided us fruitful insights and irreplaceable understandings towards the phenomenon of definiteness and the use of *the* in English. However, one shortcoming of some of the studies we have discussed is that, except for a few of them (e.g., Fraurud's study on ontological properties and the studies of noun phrase familiarity status by Gundel and Prince), many of the studies lack extensive quantitative data to follow-up on (or "support") their claims and generalizations. In some of the studies, mainly examples created by the researchers, rather than those that were found in naturalistic settings were used to provide illustrations and generalizations.

While qualitative observations with constructed examples may gain us very insightful generalizations about a linguistic structure, observations and quantitative measures drawn from naturalistic data to follow up on these generalizations, if technically possible, shall not be missing.

This is because naturalistic observations (from a corpus) would help us to identify more complex phenomena and relevant patterns regarding the usage of the structure. In the meantime, quantitative measures enable us to verify the assumptions we made about a linguistic structure more objectively, without being based solely on qualitative observations and subjective intuition judgments. For example, as I have mentioned, the previous observations of the use of *the* were often made with a perspective that the use of the article is primarily "anaphoric". Yet, when one examines instances found in natural discourse, instances that are "antecedent-less" are common. In addition, one would find that semantic information on many occasions would play a role in the interpretation of the referent denoted with *the*. Hence, while assumptions and models that were made based on the intuition that definite nominals are anaphoric may work for some expressions, they would not work for many other instances one actually encounters in discourse. Without paying close attention to naturalistic data and measures, one would perhaps "forget" how frequent the non-anaphoric kind of definite nominal expressions could be and one is less likely to include them in the generalizations (for another example on how quantitative measures can verify discourse models, see Low 2004 for a discussion that evaluates the predictions of Centering Theory and Sidner's focus model with quantitative measures).

In light of the above consideration, this paper studies the semantic properties that contribute to the definite encoding of *the*, with the analysis of quantitative data and natural instances found in natural discourse contexts. It is true that in many cases, the interpretation of the article in discourse relies on finding an antecedent. An anaphoric approach in those cases would explain the primary source of definiteness. However, while many studies have been devoted to describing how antecedents can be found or established, only a very limited amount of effort has been given to see what or how the semantic properties of a noun may contribute to its being formally definite. This paper also attempts to right this balance, by studying the semantics of definites in discourse, and by looking at the correlation between the frequency of definite noun phrases and their semantic content.

3.2 Antecedent-less Definites in Discourse

First, I analyzed 2204 definite and indefinite noun phrases in a corpus to study the characteristics of definiteness, and to see how often definites are used without an explicit antecedent.

3.2.1 Data

The 1417 definite noun phrases (with *the*) and 787 indefinite noun phrases (with *a* or *an*) of this study were found in a corpus of 28,200 words. The corpus contains two pre-transcribed interviews (9,580 words) and twenty articles of various genres. The twenty articles are five stories (narratives, 4,528 words), five news articles (factual reports, 3,636 words), five columns (opinions, reports, and personal experiences, 5,743 words), and five consumer reviews (personal experiences and opinions, 4716 words). All the transcriptions and articles were sampled from the Internet across a period of 9 months. A summary of the details of each article and the interviews is presented below:

	No. of words:	**Total no. of definites, quotations included**	**No. of definites, quotations excluded**	**Percentage of *the* in text**	**No. of Indefinite NP of *a* or *an***	**Percentage of *a* or *an* in text**
COLUMNS:	5,743	233	205	4.06%	190	3.31%
NEWS:	3,636	221	179	6.08%	88	2.42%
REVIEWS:	4,716	254	251	5.39%	125	2.65%
STORIES:	4,528	294	241	6.49%	105	2.32%
INTERVIEWS:	9,580	541	541	5.65%	279	2.91%
Total:	28,203	1,547	**1,417**	5.52%	787	2.79%

Table 1: Basic statistics of the 20 articles included in the current database

3.2.2 Antecedent-less Definiteness

Every noun phrase was analyzed to see if it has an explicit mention in its context, and if not, to see what properties might contribute to its definiteness It was found that similar to what has been reported in some other studies (Gundel et al. 2001; Poesio & Vieira 1998; Fraurud 1996), many definite noun phrases in actual discourse are antecedent-less.

		A Written Text	*B* %	*E* Interview	*D* %
A	NPs with at least one explicit antecedent (i.e., discourse old)	251	28.65%	73	13.49%
B	Others that do not have an explicit antecedent	**265**	30.25%	**169**	31.24%
C	Definite NPs that involve a proper name expression	**96**	10.96%	**27**	4.99%
D	Entities of single instances or generic referring	**53**	6.05%	**66**	12.20%
E	Definite NPs with descriptive information (e.g., relative clauses, possessive, prepositional phrases)	211	24.09%	206	38.08%
	Total:	876	100%	541	100%

Table 2: Types of Definite NPs in Current Corpus

Table 2 shows the result of the analysis. We can see that after excluding noun phrases that contain descriptive information about the referent in themselves (i.e., possessive expressions, relative clauses, and prepositional phrases, in row E), only 251 NPs out of 876 NPs in the written corpus have an explicit antecedent in their context, as do 73 NPs in the interview corpus. On the other hand, 414 NPs out of 876 NPs in the written corpus, as well as 262 NPs out of 541 NPs in the interview corpus, can be considered as semantic oriented definites. The total number of semantic definites contributes to almost half of the definite noun phrases in the whole corpus, about 47.7%.

3.2.3 Semantic Definites of Two Kinds

I divided the semantic definites found in the corpus into two types: Lexical Definites and Schematic Definites. While the first type, Lexical Definites, have been identified by other scholars with different terminologies, Schematic Definites (described by Löbner as related to complex functional concept in the head noun itself), have received less attention; and their characteristics have sometimes been overlooked.

3.2.3.1 "Lexical" Definites

Lexical definites include definite noun phrases that have an open class noun in the noun phrase, and whose semantics favor a definite interpretation. Since identifying this type of definites in a corpus involves one's semantic intuition, their classification could then be subjective. Lexical Definites include definites of various semantic classes. For example, some of them involve the use of proper names; some denote functional concepts; and some possess referents of an inherently unique semantic nature.

First, an obvious sign of intrinsic definiteness is the use of a proper name with a definite article. The proper name may occur as the head noun of the definite, but it does not have to. It can also be of various ontological types. Some examples are given in (5). The ontological distribution of them is shown in Table 3.

	Frequency	Percentage	Category freq. in all Def. NP	Category freq. in all Indef. NPs
Human Entities	37	**30.08%**	10.02%	9.03%
Institutions/Organizations	47	**38.21%**	8.82%	4.07%
Place/Locations	19	15.45%	13.48%	6.62%
Movable, Inanimate Objects	12	9.76%	13.90%	19.21%
Parts of Inanimate Objects	2	1.63%	6.99%	3.69%
Others	6	4.88%		
Total	**123**	**100%**		

Table 3: Ontological distribution of proper names associated with definites

(5) Referring to a social institution, an organization, or a formal event:
To critics of the ongoing Microsoft litigation – those who support the settlement reached in November by ***the Department of Justice*** *and nine other states – the case should be limited to the points addressed by the appeals court...*

The Conference on Interaction and Confidence-Building Measures in Asia *is due to begin Monday and end Wednesday.*

Referring to a location:
In the west, dim sum came about as a natural result of 19th-century Chinese immigrants – most of whom were from ***the Canton region*** *– settling on the East and West coasts.*

People came out of their homes and stood on housetops to look toward ***the San Francisco Peaks****...*

Referring to human entities:
*Indian Defense Minister George Fernandes said Sunday that he was hopeful the conflict could be defused after comments Saturday by Musharraf in which **the Pakistan leader** virtually dismissed the chances of nuclear war.*

*. . . which companies are more likely to dominate the digital age, the established media operations, or the start-up Internet companies? I put that question to **the Managing Director of Microsoft Australia, Paul Houghton**.*

The second type of Lexical Definites includes definites that denote functional concepts, such as those in (6) (in which the concepts "corner" and "part" are typically interpreted in terms of some other entities, such as the concepts "room" and "warranty" in the two sentences.)

(6) *There was no sound in **the little room** save the tick, tick of the great clock in **the corner**, the comfortable purr-rr of old Tommy and the beating of the rain against the window.*

*__The warranty__ is four years for the magnetron tube. That four years does not include the labor, just **the parts**.*

Finally, there are definites that denote entities that are considered to be unique instances of the universals, such as those in (7):

(7) ***The sun** was just peeking over **the horizon**.*
*He apologized, explaining that he needed to wet his paws or they developed cracks in **the warm spring air**.*

A summary of the frequencies of Lexical Definites is shown in Table 4.

	Written	*Interview*	*Total*	**Per. In all 1417 Definites**
Proper Name Definites:	96	27	123	9%
Functionals:	132	64	196	14%
Entities of single instances:	8	0	8	1%
Total:	236	91	327	23.08%

Table 4: Frequencies of Lexical Definites

3.2.3.2 Schematic Definites

Some definite noun phrases are definite, because they consist of elements that have certain abstract properties. This type of definite can be defined as Schematic Definites (which may briefly correspond to Löbner's description of "Complex Functional"). My analysis shows that among the 1417 definites, 195 of them (i.e., about 14%) contain some types of abstract modifying elements favoring the use of a definite article with the noun phrase, regardless of the discourse contexts (Table 5, idioms were excluded).

Many of the abstract elements in semantic definites are indeed closed class elements (Talmy 2000:23). When occurring with the article *the*, they often provide a relational schema that places the referent in an abstract schematic context. Schematic Definites include those expressions that

Types:	*Freq.*	*Per.*
– Comparative (e.g., *better*, *worst*)	68	34.87%
– Contrastive Meanings (e.g., *the only*, *the same*)	31	15.90%
– Ordinal (e.g., *the first*, *the second*, *the fourteenth*)	19	9.74%
– Temporal, or Relative Positions (e.g., *the side of*, *the next day*, *the month before*)	42	31.54%
– Quantitative (*all the*, *a few of the*)	35	17.95%
Total:	195	100%

Table 5: Frequencies of Schematic Definite NPs

are typically used to express quantities (e.g., *a few of*, *the rest of*, about 18%), relative positions (e.g., *the other*, *the middle of*, *the early*, about 32%), ordinal concepts (e.g., *first*, *second*, about 10%), and the status of familiarity (e.g., *famous*, *well-known*). They also include some adjectives that are "contrastive" in their semantic content (e.g., *big*, *small*, *only*, about 16%).

The interpretation of Schematic Definites involves abstract concepts that are spatial. Rather than providing some "descriptive" content that enables the addressee to establish a referent, Schematic Definites contain abstract information to situate the referent in an abstract "frame", or to state the relationship between a referent and that "conceptual" frame. For example, a Schematic Definite can contain a superlative (or comparative) modifier that implies the existence of a conceptual frame. Then, the specification of the referent, i.e., the head noun, would serve to define the scope of the frame it belongs to, as well as to indicate its own membership within the frame. This type of schematic interpretation can be commonly found with a superlative element, with the frame of the comparative schema being merely implied:

(8) *Then on St. Patrick's Day his cat was playing with a little doll and he grabbed it away. To his surprise it wasn't a doll at all, but a man of* ***the tiniest size****.*

Still, it is probably true that ***the best dim sum chefs*** *are found not in China but in Hong Kong…*

In some other cases, the abstract information in a Schematic Definite NP can also lead the addressee to conceive an entity in the noun phrase as dividable, in addition to indicating which or where the referent is in the divided sets. For example,

(9) *Finally,* ***the last day of school*** *arrived and the elf was free to go.*

The sound was coming from ***the middle of Amanda Gray's freshly made bed****.*

But ***most of the criticism of SJC*** *is that it simply wasn't built to accommodate the influx of travelers and the increase in security.*

In the above examples, the entities, *school*, *bed*, and *the criticism* are not intrinsically, or by default, conceived as some "separable" sets themselves. The elements *last*, *middle*, and *most* somehow added this interpretation, and made the entities they modified become conceivable as a separable set, by specifying which part within the set is being referred to.

As I have suggested, Schematic Definites have a strong tendency to occur with the definite article. In many cases, the definiteness of those noun phrases seems to be mandatory, due to the schematic elements involved. For example, an indefinite interpretation with some of them can be unnatural, if not impossible (10).

(10) ?*a middle of the bed*
?*most of some criticism*
?*a rest of the books*
?*the rest of some books*

In fact, in actual discourse, many of these schematic expressions bear a high frequency in occurring with a definite article. An Internet search with the Google engine reveals that many schematic elements have a relatively high frequency to occur with the definite article *the*, when compared to their frequency of occurring with the indefinite marker of *a* (or "*an*") in natural discourse. In some cases, the frequency of a schematic form to occur with the definite marker far exceeded its frequency to occur with an indefinite article. Some examples are shown in Table 6.

Table 6 shows that the use of superlative (e.g., the suffix *-est*), certain quantifiers, and some position expressions in English can render the noun phrase to be highly "definite" (e.g., the ratio of *X wisest* is about 900 to 1, the ratio of *X middle of* is about 74 to 1). This explains why an indefinite interpretation of these noun phrases could be "unnatural". In addition, due to its schematic nature, one can hypothesize that, cognitively, the comprehension process involved in this type of noun phrase could be very different (e.g., perhaps more automatic), compared to other types of definites many have considered.

3.3 Ontological Categories and Definite Encoding – A Frequency Survey

The data presented in the last section suggest that the semantic properties embedded in a noun phrase can play a role in its definiteness. However, questions remain. Are some semantic properties in fact "more definite" than the others are (like Löbner and Fraurud have suggested)? Are we in fact more likely to say *the door* instead of *a door*, or to say *the kitchen* more often than saying *a kitchen*?

In order to see if some nouns of certain semantic properties in fact favor definite encoding over indefinite encoding, we need to compare their definite occurrences more directly with their indefinite occurrences.

3.3.1 A Preliminary Observation

First, to gain some preliminary observations on whether ontological categories do have an effect of definite frequency, I categorized the ontological properties of the noun phrases found in the corpus described in the last section, with a set of categories developed partially based on the semantic classification used in DuBois (1980). Then, I compared the semantics of both definite noun phrases (with *the*) and indefinite noun phrases with *a* or *an*) in the corpus.

In this relatively small sample of noun phases with repetitive referents, nouns that belong to certain semantic categories seem to occur more frequently with one article, but less with the other. The frequencies of each semantic category across the two articles are ranked and listed in Table 7.

Table 7 displays the percentages of definite noun phrases and indefinite noun phrases that belong to different ontological categories in the corpus. For each category, the percentage difference between the definite and indefinite noun phrases are ranked and presented in column E. In the current sample, which I used only as an initial observation, noun phrases that denote locations, social institutions, and parts of inanimate entities show tendencies to occur as definite. The three categories are 6.85%, 4.75%, and 3.30% higher in their definite usage, respectively,

Expressions	*A* Search results x = *a* or *an*	*B* Search results x = *the*	*C* Ratio: the:a, (B/C) X:1
Superlative Expressions:			
x wisest	110	99,500	905
x most common	4,330	2,950,000	681
x very best	2,930	1,470,000	502
x biggest	9,780	4,230,000	433
x earliest	4,750	1,770,000	373
x largest	21,900	5,960,000	272
x fastest	9,860	2,540,000	258
x latest	27,200	6,730,000	247
x tiniest	972	103,000	106
x nearest	36,100	2,180,000	60
most of x	135,000	5,360,000	40
Expression of Quantity:			
one of x major	1,030	1,140,000	1107
a few of x	2,830	1,800,000	636
x rest of	7,380	4,690,000	635.5
many of x	11,400	5,590,000	490
some of x	25,700	7,350,000	286
the rest of x	23,100	4,000,000	173
Expressions involve relative position:			
x middle of	39,300	2,910,000	74
x above	167,000	5,840,000	35
x end of	296,000	6,830,000	23
x bottom	416,000	5,530,000	13
x side of	135,000	1,630,000	12
Expressions involve contrastive meaning:			
by x same	2,280	1,940,000	851
x right way	30,900	1,640,000	53
x only	159,000	7,560,000	48
x same	206,000	8,630,000	42
x opposite	149,000	2,650,000	18
Temporal Expression:			
x last time	12,900	1,660,000	128.682

Table 6: Frequencies of Schematic Elements on the Internet

when compared to the percentages of their indefinite usage. On the opposite end, noun phrases that denote states of affairs (or events), movable inanimate entities and quantities of objects are more likely to be encoded as indefinite. In those cases, the percentages of the noun phrases to be indefinite is 10.22% higher for noun phrases that denote events, 5.31% higher for those that denote movable inanimates, and 4.26% higher for noun phrases that denote quantities.

	A **Definite NPs**	*B* **Per.**	*C* **Indefinite NPs**	*D* **Per.**	*E* **Difference (B–D)**
Locations	191	13.48%	52	6.62%	**6.86%**
Institutions or social establishments	125	8.82%	32	4.07%	**4.75%**
Part of inanimate entities	99	6.99%	29	3.69%	**3.30%**
Human terms	142	10.02%	71	9.03%	0.99%
Generic referring	15	1.06%	1	0.13%	0.93%
Body parts	13	0.92%	2	0.25%	0.66%
Smells	6	0.42%	0	0.00%	0.42%
Plants	5	0.35%	0	0.00%	0.35%
Metaphoric expressions	21	1.48%	9	1.15%	0.34%
Emotions	8	0.56%	3	0.38%	0.18%
Ordinal	2	0.14%	0	0.00%	0.14%
Sounds	2	0.14%	3	0.38%	−0.24%
Senses	12	0.85%	9	1.15%	−0.30%
Clothes	2	0.14%	4	0.51%	−0.37%
Non-human animate	4	0.28%	6	0.76%	−0.48%
Temporal	47	3.32%	44	5.60%	**−2.28%**
Quantity	1	0.07%	34	4.33%	**−4.26%**
Movable inanimate	197	13.90%	151	19.21%	**−5.31%**
Events, state of affairs	131	9.24%	153	19.47%	**−10.22%**
Unclear	3	0.21%	3	0.38%	−0.17%
Abstract	391	27.59%	181	23.03%	4.57%
Total:	1417	100%	787	100%	

Table 7: Ontological distributions of definite (*the*) and indefinite (*a*) noun phrases in the corpus

The initial observation presented above suggests that nouns of certain ontological categories could more often occur in a definite noun phrase than in an indefinite one. However, the results derived from this observation could be imprecise, because noun phrases that refer to the same entity in the corpus were not excluded. A more diverse sample and some inferential measures are therefore needed to see if these differences of encoding preference indeed exist among the ontological categories. Next, I will present a study to do this, with a survey of frequencies on the Internet.

3.3.2 Method Using a Search Engine: the Choice of Web Engine Data vs. Corpus Data

Before proceeding, I shall make a couple of notes on the methodology used. Although using word frequencies to make qualitative generalizations of syntactic forms is common in functional linguistics and computational linguistics, the utilization of web search frequencies to do this is only recent, if not novel (e.g., Modjeska et al. 2003, an example of using web-data in machine learning; Kilgarriff 2003, a proposal for a linguistic search engine).

This study used web-search data as a primary source of analysis because of two considerations. The first consideration is that, using web data, one can access a vast amount of data simultaneously. The sample texts that can be tapped into with an Internet search engine are larger

in amount and more diverse in content, when compared to those obtained with the method of individual corpus sampling. For example, the search engine used in this study (i.e., the Google engine) contains about 3,307,998,701 unfiltered web pages on the Internet (this figure was recorded during the course of the data collection of this study).

The second reason to use a web search engine in this study is the advantageous form of the data it can collect. Unlike measuring the frequency of a string using a set of corpora, the current method searches the frequency of a string (e.g., *the pen*) on the Internet and finds the number of the web pages or web sites that contain at least or only once the searched string. This form of data is particularly suitable for the study of anaphoric constructions, because all the potential "antecedents" of a string in the same text will be excluded in the count. Each counted instance is "independent" from the others (i.e., it does not occur in the same text with other counted instances; there is no anaphoric relationship among them). It would be hard to obtain frequency data of this kind with the traditional method of corpus counting.

3.3.3 A Frequency Comparison of *the* vs. *a*

To see if some nouns in fact favor a definite encoding over an indefinite one in natural discourse, a web-search study was conducted to compare the number of *the* and *a* being used with a set of nouns.

3.3.3.1 Sample, Data and Procedure

A sample of 1399 nouns was collected from the current corpus (of 28203 words) and the British National Corpus (BNC). The syntactic status of each word was verified with several means: the BNC tagging (for the entries from BNC), the category listing in two electronic dictionaries, and a grammatical check of the strings "*a* + N" and "*the* + N" with a word processor (MSWord). A manual verification was also made as a final step to exclude some "verby items" that are only used as nouns in extremely rare occasions. All nouns that have a vowel initial were excluded (i.e., "*an* + N" were excluded, since the phonological variations of *a* vs. *an* was not studied); and only nouns of their singular form were considered.

The 1399 nouns were classified into different ontological categories (which were developed from the semantic categories used in DuBois 1980). The tallied results are ranked and shown in Table 8.

Each noun was then fed to the Google search engine as four different strings (i.e., two syntactic environments and their variations, see (11)):

(11) *a* + [N] (e.g., *a pen*)
a + * + [N] (e.g., *a * pen*)
the + [N] (e.g., *the pen*)
the + * + [N] (e.g., *the * pen*)

The 5596 strings (i.e., 1399 nouns with 4 variations of syntactic environments) were entered into the Google search engine with the search criterion of "exact phrase match", "English text only" and "in the text of the web page". The frequency result of each string were recorded and tallied.

Types	**Frequency**	
Terms for state of affairs or events (e.g., *battle*, *dinner*, *glance*)	291	20.8%
Terms of movable inanimate entities	193	13.8%
Terms that denote humans or human agents (e.g., *friend*, *teacher*)	162	11.6%
Terms of (geographical) locations	88	6.3%
Terms denote parts of inanimate entities	86	6.1%
Quantity terms (e.g., *bunch*)	47	3.4%
Entities of specify property	46	3.3%
Foods/dishes	36	2.6%
Body parts	34	2.4%
Terms of social institutions/establishments (e.g., *government*, *firm*, *nation*, *parliament*)	29	2.1%
Non-human, animate terms	26	1.9%
Temporal expression	24	1.7%
Entities of nature (e.g., *moon*, *star*, *mountain*)	21	1.5%
Terms of emotions or senses (e.g., *fear*)	26	1.9%
Plants or part of plants (e.g., *leaves*)	13	0.9%
Superlative	6	0.4%
Others (e.g., *terms of clothes*, *decease*)	20	1.4%
Terms of relatively ambiguous or abstract concepts (e.g., *consciousness*, *discourse*, *secret*)	232	16.6%
Doubted/unclear	19	1.4%
Total:	1399	100%

Table 8: Ontological distribution of 1399 nouns for study I and II

3.3.3.2 Verification of the Sample Text Pool

Since the data obtained were from a set of "untrimmed" samples (collected by the specific search engine being used), they perhaps contain some instances that are unfit for the purpose of this investigation (e.g., typographical errors, grammatical mistakes from non-native speakers, imperfect design of the search engine for linguistic research purposes, e.g., see Kilgarriff 2003). In addition, since this is a relatively new method of data collection, it could be unclear how well the frequency data obtained from the search engine actually reflect the frequency of the use of the string in natural discourse (and represents the ontological importance of the construction being considered). It is therefore necessary to verify the reliability of the text sample used by the search engine, to see if the data suit the purpose of the current study (that is, how accurately, in general, the pool of text samples reflects the ontological importance of a string being considered). To do so, a small test was conducted to see if a search result would be sensitive to the plausibility of linguistic usage and ontological combination. A set of either "ungrammatical" or "semantically implausible" strings was fed to the search engine and the results were compared to the search results of their "grammatical" or "plausible" counterparts (with the search criterion of "exact phrase match", "English text only" and "in the text of the web page"):

Syntactic Comparison:		
GRAMMATICAL	FREQUENCIES	
they have	11000000	
he is	9210000	
they eat	609000	
at three o'clock	41000	
in the meantime	2320000	
UNGRAMMATICAL	FREQUENCIES	UNGRAMMATICAL/GRAMMATICAL
they has	33000	0.0030
he are	43000	0.0047
they eats	274	0.0004
in three o'clock	136	0.0033
at the meantime	3230	0.0014
Average:		0.0026

Table 9: Frequencies of grammatical and ungrammatical strings searched with Google

Ontological Comparison:		
PLAUSIBLE/NORMAL	FREQUENCIES	
*cut * with a knife*	15000	
cup of tea	554000	
cows eat grass	1790	
LESS PLAUSIBLE	FREQUENCIES	LESS PLAUSIBLE/PLAUSIBLE
*cut * with a stick*	34	0.002
bowl of tea	4700	0.008
cows eat leaves	6	0.003
IMPLAUSIBLE	FREQUENCIES	IMPLAUSIBLE/PLAUSIBLE
*cut * with a candy*	1	0.000067
plate of tea	69	0.000125
cows eat lemons	0	0.000000

Table 10: Frequencies of semantically plausible and implausible strings searched with Google

Table 9 and Table 10 show the frequency comparisons of the plausible and implausible strings. The results suggest that frequency data obtained from the Google search engine can reasonably reflect how common a string is being used in the language. We see that when a string is ungrammatical (e.g., *they has*, *in three o' clock*) or semantically implausible (e.g., *cut* [something] *with a candy*, *cows eat lemons*), its number of occurrences found in the search is, as expected, extremely low or even zero. The number of occurrences of an unambiguously ungrammatical string is usually less than one percent of the frequency of its grammatical counterpart. The frequency of a semantically plausible and common string (e.g., *cup of tea*: 554000 occurrences) is also reasonably different from that of a less plausible one (e.g., *bowl of tea*: 4700 occurrences) and the implausible one (e.g., *plate of tea*: 69 occurrences). Thus, although data

from a web-search engine may not suit all types of linguistic analyses, they are at least useful for the current purpose, which is to investigate how common a string is used across different texts.

3.3.3.3 Ratio of "the:a" in Natural Discourse

As an additional reference, a series of "baseline" frequencies of the definite form *the* and the indefinite form *a* were also obtained, through measuring the frequencies of the two forms in various corpora. This set of baseline frequencies and the ratio of the two forms are presented in Table 11:

	Total *a*	**Total *the***	**"the:a" ratio**	**Usage of *the***
Google Web Corpus				
Search 1 April	13,600,000	14,700,000	1.08:1	51.94%
Search 2 April	11,800,000	12,800,000	1.08:1	52.03%
Search 3 Jun	13,300,000	14,100,000	1.06:1	51.46%
Search 4 Jun	12,300,000	13,300,000	1.08:1	51.95%
Search 5 Aug	12,700,000	14,000,000	1.10:1	52.43%
Search 6 Sept	17,800,000	18,600,000	1.04:1	51.10%
Google News Only Corpus				
Search 1 April	685,000	803,000	1.17:1	53.97%
Search 2 April	724,000	826,000	1.14:1	53.29%
Search 3 Jun	708,000	844,000	1.19:1	54.38%
Search 4 Aug	716,000	787,000	1.09:1	52.36%
Search 5 Sept	699,000	789,000	1.12:1	53.02%
Other Corpora				
Interview in current study	255	543	2.13:1	68.05%
Written text in current study	458	1,019	2.22:1	68.99%
A corpus from web ("Zen" stories)	2,200	5,630	2.56:1	71.90%
The British National Corpus	21,626	61,847	2.86:1	74.09%
The Bible, Basic English Version	10,819	65,829	6.08:1	85.88%

Table 11: Baseline frequencies of *the* vs. *a* in various corpora

Table 11 shows that with a web-search procedure, one would find both the indefinite article *a* and the definite article *the* have about an equal chance of occurring in a web page (with the frequency of *the* slightly higher than that of *a*). On the other hand, if the size of the corpus is smaller, or if it is of a more continuous nature, where an entity is likely to be mentioned more than once (e.g., in the Bible), the ratio will rise, towards favoring a larger frequency of *the*.

3.3.3.4 Descriptive Results

3.3.3.4.1 General Measures

First, both the population usage of *the* and the population usage of *a* were obtained. The population ratio of *the* vs. *a* obtained with the 1399 nouns in this study is about 1:1.4 and the average use of *the* is 58.57% (Table 12).

	Frequency	**Percentage**
Population usage of *the* (*the*–N, *the*–*x*–N):	3326774436	58.57%
Population usage of *a* (*a*–N, *a*–*x*–N):	2353538175	41.43%
Total usage:	5680312611	100%
Ratio (*the*:*a*):		1:1.4

Table 12: Baseline usage of the two articles on the Internet

The differences between the usage of *the* of each noun was compared to the population usage of 58.75%. Among the 1399 nouns, 685 items (48%) have a usage of *the* higher than 58.57%, and 714 items (51%) have it smaller than that average percentage.

The ratio of *a*:*the* (when the frequency of the *a* usage is larger than that of *the* for the noun) or the ratio of *the*:*a* (when the frequency of the *the* usage is larger than that of *a* for the noun) were also calculated for each noun.

3.3.3.4.2 Extreme Cases

If the semantic traits of a lexical item have little bearing on its being definite or not, the chance of each noun to occur with a definite article should be comparable to the baseline variations, which is the average proportional usage of the marker *the*. However, some extreme proportions and ratios were found on both directions. Indeed, some nouns are much more likely to be used with one marker over the other. For example, the Table 13 shows 60 items, on each end, having the highest percentage difference when compared to the population average. The ratios of *the*:*a*, or *a*:*the*, are also displayed for each item, in column C and F.

Table 13 shows 30 items that are most likely to occur with the marker *the* (in column A) and 30 items that are most likely to occur with the article *a* (in column B). It is obvious that even just using one's intuition, many of the "definite-oriented" items appear to be "unnatural" when being used with the marker *a* (e.g., *the bottom* vs. *a bottom*, *the hype* vs. *a hype*, *the disappearance* vs. *a disappearance*). Similarly, many "indefinite-oriented" items also feel unnatural to be modified by the article *the* (e.g., *a glance* vs. *the glance*, *a classmate* vs. *the classmate*, *a friend* vs. *the friend*). Yet, without needing an informant or a questionnaire, the results quantify this intuition of a native speaker. Nouns that are intuitively unnatural to occur with an indefinite marker indeed yield a high *the* to *a* ratio (e.g., *fastest*, 138 to 1, *legislation*: 36.70, *hype*: 27 to 1). Nouns that feel unnatural occurring with a definite maker also yield a high *a* to *the* ratio (e.g., *glance*: 56.78 to 1, *friend*: 14.54 to 1, *misdemeanor*: 10.78 to 1).

	A	*B*	*C*	*D*	*E*	*F*
	Items favor definite encoding	**Deviation from 58.57%**	**the–a ratio (x:1)**	**Items favor in definite encoding**	**Deviation from 58.57%**	**a–the ratio(y:1)**
1	*fastest*	40.71%	138.13	*glance*	−56.84%	56.78
2	*tiniest*	40.64%	125.78	*dollop*	−55.46%	31.18
3	*latest*	40.55%	112.13	*foothold*	−53.74%	19.71
4	*subcontinent*	40.01%	69.19	*friend*	−52.13%	14.54
5	*legislation*	38.78%	36.70	*misdemeanor*	−50.08%	10.78
6	*same*	38.40%	32.02	*reminder*	−49.66%	10.23
7	*preteen*	38.21%	30.02	*shrug*	−46.25%	7.12
8	*crux*	37.89%	27.19	*sigh*	−45.41%	6.60
9	*hype*	37.87%	27.08	*sprig*	−45.07%	6.41
10	*courage*	37.22%	22.76	*nap*	−44.93%	6.33
11	*southwest*	36.59%	19.65	*classmate*	−44.49%	6.10
12	*disappearance*	36.40%	18.88	*plea*	−43.98%	5.85
13	*coast*	36.26%	18.33	*tablet*	−43.71%	5.73
14	*pleasance*	36.15%	17.92	*bunch*	−43.02%	5.43
15	*conduct*	35.58%	16.08	*thousand*	−42.98%	5.41
16	*hustle*	35.27%	15.23	*trice*	−42.05%	5.05
17	*decency*	34.88%	14.26	*gift*	−41.02%	4.70
18	*remain*	34.86%	14.21	*smile*	−40.90%	4.66
19	*mend*	34.84%	14.16	*variety*	−40.51%	4.54
20	*worst*	34.66%	13.76	*byproduct*	−40.49%	4.53
21	*bottom*	34.37%	13.17	*stinker*	−39.82%	4.33
22	*fore*	34.06%	12.56	*treat*	−39.78%	4.32
23	*lord*	34.04%	12.53	*fellow*	−39.76%	4.32
24	*significance*	33.63%	11.81	*gallon*	−39.61%	4.28
25	*creation*	33.20%	11.14	*vacation*	−39.42%	4.22
26	*damage*	32.96%	10.80	*whiff*	−39.40%	4.22
27	*parliament*	32.72%	10.48	*hundred*	−39.23%	4.17
28	*removal*	32.28%	9.93	*snack*	−38.07%	3.88
29	*bureau*	32.22%	9.86	*lot*	−38.06%	3.88
30	*horizon*	32.13%	9.75	*laugh*	−37.84%	3.82

Table 13: Top 30 items favoring the encoding of *the* (column A–C) and top 30 items that favor the encoding of *a* (D–F)

3.3.3.4.3 Ontological Categories

To examine the semantic tendency of definiteness, the ontological categories of the top 10% of definite-oriented items and the top 10% indefinite-oriented items were tallied. The results are shown below in Table 14 and the differences between the indefinite usage and definite usage for each category is shown in column I and presented in a bar chart in Figure 2.

Columns E and G in Table 14 show the proportional distributions of various ontological categories within the top 10% of definite-oriented items and the top 10% of indefinite-oriented

	A **Population Freq. /f(e)**	*B* **%**	*C* **Top 10% of items with Def. Tendency**	*D* **%**	*E* **D–B**	*F* **Top 10% of Items with Indef. Tendency**	*G* **%**	*H* **G–B**	*I* **Def. – Indef. (D–G)**
State of affairs or events	291	20.8%	26	18.71%	−2.10%	53	38.13%	**17.33%**	−19.42%
Body Parts	34	2.4%	3	2.16%	−0.27%	2	1.44%	−0.99%	0.72%
Directions	4	0.3%	3	2.16%	1.87%	0	0.00%	−0.29%	2.16%
Entities of nature	21	1.5%	8	5.76%	**4.25%**	0	0.00%	−1.50%	5.76%
Emotions/Senses	26	1.9%	3	2.16%	0.30%	0	0.00%	−1.86%	2.16%
Foods	36	2.6%	3	2.16%	−0.41%	4	2.88%	0.30%	−0.72%
Humans	162	11.6%	12	8.63%	−2.95%	25	17.99%	**6.41%**	−9.35%
Institutions/ Social Establishments	29	2.1%	7	5.04%	2.96%	1	0.72%	−1.35%	4.32%
Locations	88	6.3%	17	12.23%	**5.94%**	1	0.72%	−**5.57%**	11.51%
Movable inanimate	193	13.8%	6	4.32%	−**9.48%**	23	16.55%	2.75%	−12.23%
Parts of inanimate	86	6.1%	14	10.07%	3.92%	1	0.72%	−**5.43%**	9.35%
Plants	13	0.9%	2	1.44%	0.51%	0	0.00%	−0.93%	1.44%
Entities of specify property	46	3.3%	7	5.04%	1.75%	5	3.60%	0.31%	1.44%
Superlatives	6	0.4%	6	4.32%	3.89%	0	0.00%	−0.43%	4.32%
Temporal terms	24	1.7%	4	2.88%	1.16%	0	0.00%	−1.72%	2.88%
Quantity terms	47	3.4%	0	0.00%	−3.36%	17	12.23%	**8.87%**	−12.23%
Abstract, Un-classified	232	16.6%	17	12.23%	−4.35%	6	4.32%	−12.27%	7.91%
Doubted	19	1.4%	1	0.72%	−0.64%	1	0.72%	−0.64%	0.00%
Total:	NA	NA	**139**	100%		**114**	100%		

Table 14: Ontological distribution of the top 10% of definite-oriented items and top 10% indefinite-oriented items

items. When compared to their general frequency (column B), the members of some categories bear a high chance of occurring with the definite marker *the*. They are, for example, terms that denote entities of nature, terms of location and nouns that denote movable inanimate objects. On the other hand, nouns that denote events, humans, and quantities are likely to occur with the indefinite marker. The last column, column I, shows the distribution differences between the definite oriented items and the indefinite oriented items for each category. A high number suggests a relatively high chance for the item in the category to be encoded with the definite marker; a low number suggests a tendency of the member in the category to be modified by the indefinite marker. The categories and their numbers are ranked and presented as a bar chart in Figure 2 (abstract terms, for their ambiguous nature, are excluded).

Figure 2 shows that locations, parts of inanimate objects, entities of nature, and nouns of superlatives are likely to be encoded in a definite noun phrase. Terms for events, movable inanimate objects, quantities, and words refer to humans are quite likely to occur in an indefinite noun phrase. This observation is coherent with the observation presented earlier, in which I considered solely the definite and indefinite noun phrases in the corpus.

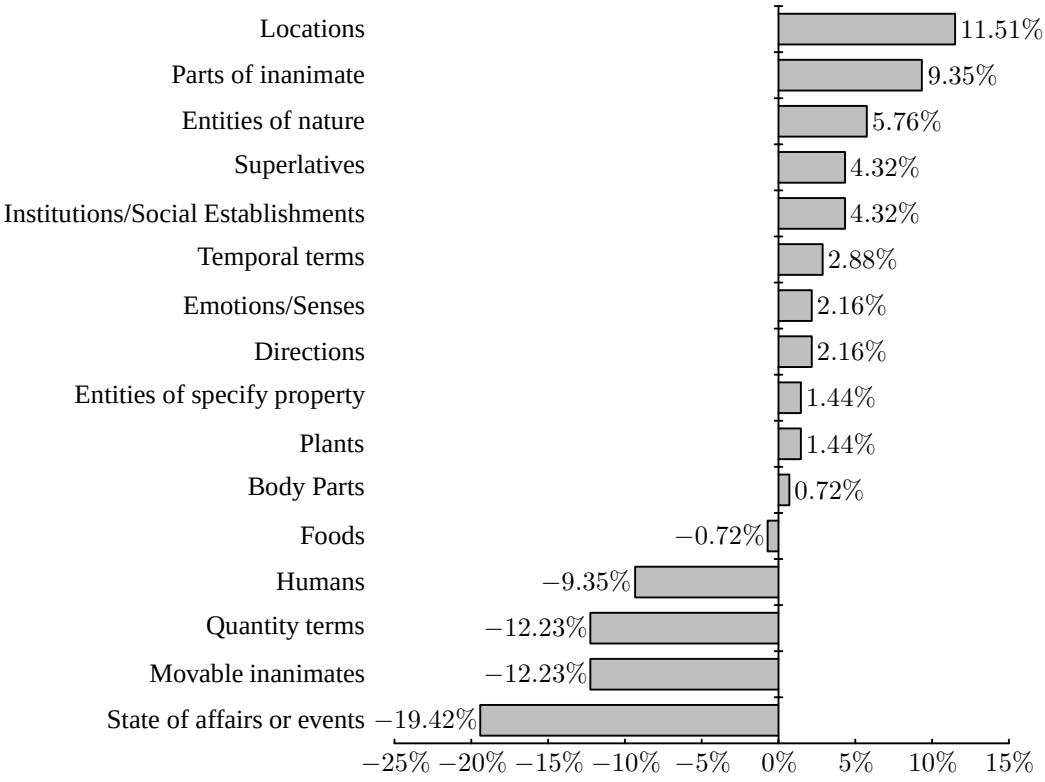

Figure 2: A comparison of the ontological distributions of "definite-oriented" items and "indefinite-oriented" items in a bar chart

3.3.3.5 Inferential Results

The data presented in the last section is only descriptive. To verify the results inferentially, statistic tests were conducted. Kruskal-Wallis test showed that the frequency percentage of *the* within each ontological category is significantly different from that of the population ($P \leq 0.001$, Df = 19, χ^2 = 207.56). A Mann-Whitney U test (with Bonferroni adjustment, P set to $=$ or < 0.0013) was then conducted for multiple comparisons, to see if the definite usage found in each ontological category is significantly different from that of the population of 1399 nouns. Table 15 shows the categories that have their definite frequencies significantly different from the whole sample population.

Table 15 shows that the eight ontological categories, which have been identified to have an effect of definiteness in the last section, indeed have their usage of *the* significantly different from that the whole sample population. These categories are: (1) locations (2) parts of inanimate objects, (3) entities of nature (4) nouns of superlatives, (5) terms for events, (6) movable inanimate objects, (7) quantities, and (8) words referring to humans.

Categories	**Tokens**	**Total Usage of *the* (%)**	**Probability < 0.0013 (two-tailed)**	**Direction obtained from previous section:**
Location	88	47.14	0.00000001	Definite Oriented
Quantity Terms	47	41.61	0.0000025	Indefinite Oriented
Movable-Inanimate Entities	193	56.01	0.0000044	Indefinite Oriented
Parts of Inanimate	86	46.92	0.0000084	Definite Oriented
Superlatives	6	29.16	0.0000328	Definite Oriented
Entities of Nature	21	35.99	0.0000921	Definite Oriented
Institutions/Social Establishments	29	38.10	0.0001425	Definite Oriented
State of Affairs or Events	291	60.10	0.0002358	Indefinite Oriented
Human Terms	162	53.52	0.0004345	Indefinite Oriented

Table 15: P-Values for Each Ontological Category (Mann-Whitney Tests)

4 General Discussion

The observations made in the current paper are consistent with those reported in similar studies by other researchers. Here are a few highlights of them. First, anaphoric definites, although a focus of many relevant studies, is not the only type of definiteness that is usually encoded with the article *the*. (It should be noted that although no one has claimed otherwise, non-anaphoric definite noun phases have usually received less attention in many models of definiteness). In addition, the data indicate that the ontological properties of the definite referent itself are often relevant to the interpretation of the definiteness of the noun phrase. For example, ontological knowledge is relevant to the interpretation of definites that denote proper names, functional concepts, and entities of unique instances. This result is coherent with the semantic view proposed by Löbner and Fraurud.

The second study in this paper shows that some nouns are indeed likely to be definite regardless of the discourse context, perhaps because of their semantic properties of "intrinsic identifiability". Some items, on the other hand, are "unlikely" to be definite, perhaps because they are semantically "vague" in content. The findings here provide a concrete set of data to illustrate what types of noun in the language would fit most into a semantic approach of definiteness. First, we see that nouns of relational or functional concepts, which can be partially instanced by the items that denote "parts of inanimate objects" in this study, indeed have a tendency of being encoding with *the*. Yet, they are not the only ones. Words that denote locations and social establishments also exhibit a relatively high chance of being encoded with the article, so do most words that denote natural entities. The patterns are coherent with the pattern of Semantic Definites discussed in the first study. For example, it is no surprise that natural entities, which are typically unique instances of the universe (e.g., "sun", "moon"), would favor a definite encoding in discourse. The frequency pattern also shows that forms of superlatives are most often modified by the marker *the*, as one would expect.

Perhaps a somewhat surprising finding here is that one also sees nouns that are unnatural to occur with *the*. The data indicate that ontological properties do not only make some nouns favor a definite encoding, they also make other nouns "disfavor" it. There seems to be two types of indefinite-oriented items. First, some indefinite-oriented items seem to have a high *a* to *the* ratio, not so much because they favor an indefinite interpretation per se, but because they

need the marker *a* to quantify them, and thus to achieve a non-default function of denoting an event as a referent. They are words that denote states of affairs or types of action (e.g., *glance*, *sign*, *nap*, *disappearance*). Intuitively, the referents of these nouns are hard to identify as unique instances of their own type; (e.g., how often can one "glance" be significantly different from another "glance", and then become "*the glance*" from the speaker's point of view?) One can also imagine these words to be rarely re-mentioned in the discourse, following a first mention. Their low compatibility with a definite interpretation is also indicated by their awkwardness of occurring with other definite modifiers in an under-informative context. For example, it is somewhat unnatural to say *my glance*, *her sigh*, or *this disappearance*.

Another type of word that disfavors a definite encoding includes nouns that denote people or objects without a specific identity. For example, words such as *friend*, *classmate*, or *snack* can be modified by a possessive pronoun (*my friend*, *her classmate*, *his snack*), yet they are not usually modified by the marker *the*. This is perhaps because when these entities are to be mentioned again in the discourse without using a pronoun, speakers tend to use other terms to refer to them more specifically (e.g., using a proper name to refer to a once mentioned concept of *friend*; be more specific about what the *snack* is).

5 Conclusions: Where does Semantics meet Pragmatics?

In this paper, I have focused on issues that concern the semantic role of definiteness. I have shown that non-anaphoric, or antecedent-less, definite noun phrases are common in discourse. Ontological knowledge is often needed for the interpretation of *the*. I also proposed that one should classify Semantic Definites into at least two categories: those that are lexical-semantic related (Lexical Definites) and those that are grammatical-semantic related (Schematic Definites). I also illustrated that some nouns are indeed much more likely to be used with *the* when compared to others, due to their own semantics.

Here, we shall answer a final question: what exactly is the role of semantics in the phenomenon of the use of *the* and how can we explain the correlation between the ontological class of a referent and definiteness?

I would propose that one can distinguish two interrelated functions (or aspects) of the use of *the* (and perhaps for linguistic structures in general.) The first one is to deliver information that is unknown to the hearer in a communicative setting, i.e., the communicative function or the pragmatic aspect of the usage. The second function is to represent human experiences in an iconic manner, i.e., the semantic function of the article.

In the communicative usage of *the*, the article is used to tell the hearer a specific piece of information that a referent should be conceptualized in terms of (or in relation to) the on-going discourse world (i.e., to tell the hearer that a referent is "unique" and "identifiable" in terms of the discourse world that is being presented, be that discourse world a fictitious one or a real-life-related one.) This is most useful when the referent has not been previously mentioned, but is intended to be interpreted as being part of, or being unique to the on-going discourse world (e.g., in the case of discourse new definite noun phrases, when the hearer cannot "predict" that the referent is a definite one). In other words, this function fits into what commonly called the performance of a "speech act" when a linguistic form is used to give instructions to the hearer (by the speaker). To study how the hearer may follow the instruction usually means to find out what type of pragmatic inferences are being drawn by the hearer. For example, in the case of *the*, the article only carries the message that a referent should be related to other entities (or another

entity) in the discourse world. However, the word *the* does not in itself tell the hearer *how* to relate that referents to other entities. This is only done by using other information that may also conventionally exist in the natural context of the article being used. The relevant information that would be used, on the other hand, may be of different types. It may be pragmatically related or has to be interpreted with certain semantic knowledge (e.g., information expressed with a relative clause, descriptive information appended to the same noun phrase, information from a semantic trigger, use of proper name references in the same noun phrase). In either case, the hearers would need to identify the appropriate information to be used (based on the pragmatic conventions triggered by *the*). Hence, perhaps one aspect of the study of *the* would be to identify potential information that can be used by the hearer in actual discourse.

However, it should also be noted that the communicative function described above may not always be robustly present in every use of a linguistic form (i.e., not every use of every linguistic form is necessarily a typical speech act). For example, the use of the plural marker in English does not always "deliver" a particular message that is unknown to the hearer. After all, from a communicative point of view, why would one need to say "two books", with both the word *two* and the plural suffix *-s* to tell the hearer twice that the quantity of the referent being denoted is more than one? Similarly, in the case of discourse old definite noun phrases, or noun phrases that are "predictable definite", the hearers may not even need to be reminded that the referent has to be related to its antecedent because they can often tell if the referent should be "discourse old", even when the article *the* is missing (e.g., when omitted deliberately to test informants' responses). I therefore suggest that the occurrence of *the* could also be motivated by another function, the function of iconicity. The function of iconicity states that certain linguistic structures commonly occur in a particular manner in many languages because such a manner is indeed reflecting or representing how humans would perceive the world in that respect (e.g., see Croft 1990). The original discussions of iconicity have been devoted primarily to the explanations of certain identifiable characteristics of linguistic forms (e.g., word/morpheme orders, morphological complexity). However, what is important here is that besides explaining forms and structures cross-linguistically, the principle of iconicity at its heart expresses an important function of language itself – to represent the structure of thoughts and human experiences (and perhaps in such a way to carry a large part of human thoughts and cognition in itself). Iconicity reflects a natural tendency of languages or linguistic forms to "represent", "mirror", or "simulate" human thoughts and experiences, even without the immediate presence of a "communicative motivation" (e.g., when a real hearer is absent, or when the message itself is already a piece of known information to the hearer and the act of "conveying" has become a redundancy). The "force" of iconicity motivates every meaning or concept in a language to have something to denote it and encourages every experience of the speaker to be mirrored with linguistic outputs if possible, not just the ones that are unknown by the hearer (and it perhaps further encourages humans' general desire to "express", rather than simply to "communicate"). Hence, agreement suffixes are there partially because they reflect part of our experience in an iconic manner (and have been historically developed in its own way). We can also make use of the rich capacity of language to structure our thoughts even when the goal of communicating is only secondary (we thought to ourselves and talk to ourselves sometimes). Similarly, the use of *the*, besides being a performance of a speech act, may mirror a cognitive "spatial" situation that resembles the physical situation denoted by its deictic origin. The use of *the* has emerged (with its historical path) to represent a situation in which a current mention is semantically connected to (or equivalent to) another entity "located somewhere else" in our mind space, which is supposedly different from where our immediate

attention is. In other words, the function of iconicity has invited a form that originally mirrors a deictic experience in English (when what is being communicated is supposed to be away from the immediate physical location of the hearer and the speaker) to also metaphorically mirror a similar structure in our cognitive space (typically in written texts). It was a form that originally used to draw the hearer's attention to something that is not in their current sight or immediate physical space (i.e., the original deictic usage), but now it has also become a form that can be used to portray (or represent) conceptual distance and temporal distance along the order of different events and entities being mentioned in a displaced context (i.e., how far away was an event being mentioned before, or the referential distance).

Finally, as I have suggested, the occurrence of *the* has two aspects, one is to communicate (pragmatically) and the other is to represent (semantically). The semantics (or the iconicity) of the article *the* itself (i.e., the conceptual experience that it represents) may explain why some nouns are more likely to occur in its noun phrase but not the others (as found in this study). What happens here is that some lexical items have their own semantics and ontological properties that drive them to be mentioned more frequently in situations where the article *the* may represent (e.g., words that denote locations are often mentioned because they are usually related to people and other entities in the same discourse world). On the other hand, some entities are unlikely to occur in the situation represented by the article, e.g., actions such as "glance" and "nap" are harder and less frequent to be conceptualized as being unique to a discourse world unless extra information is given by the speaker. Hence, what is interesting here is that the "semantics" of the article *the* may contribute to its discourse distribution because the semantics of other words may interact with the experiences or situations that it represents.

To conclude, one can say that there are both semantic and pragmatic functions to the use of *the*. In addition, the semantic function of *the* (i.e., to represent) is also important for its communicative function (i.e., what is being represented by the form can also be the "message" being conveyed in a communicative setting). However, a grammatical element does not always include details on how a particular instruction being issued to the hearer is to be carried out. The hearer sometimes needs to use pragmatic knowledge and look for contextual information to do so. Hence, while the presence of *the* may tell the hearer whether a referent should be seen as being unique to the discourse world (due to the "meaning" of the article), the hearer will rely on pragmatic knowledge to generalize *how* that referent should be seen as unique to the discourse.

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REFERENTIAL EXPRESSIONS AND THE SYNTAX-SEMANTICS (-PRAGMATICS) INTERFACE

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Abstract

This paper examines the so-called reflexive pronoun in Japanese, *jibun*. It is argued that *jibun*'s referential range needs to be restricted by contextual factors, most notably the preference or orientation imposed by the predicate used in the same utterance. A provisional account is offered using context logic, which has been discussed widely by researchers in Artificial Intelligence. Another possibility of using Optimality Theory is also discussed.

1 Introduction

The exact nature of referential possibilities of the so-called reflexive *jibun* (or *zibun*) has been a contentious issue throughout the history of Japanese linguistics. This is mainly because this expression has a wider referential range than other languages such as English. The dialectal and idiolectal variation also accounts for the controversy. One main reason for this is that the expression has non-reflexive uses as can be seen in (1)–(4):

(1) *Jibun-de yaru-kara.*
SELF-by do-because
'[I'll] do [it] myself, so [don't bother/worry, etc.]'

(2) *Jibun-wa Tanaka-de ari-masu.*
SELF-TOP Tanaka-BE exist-POLITE
'My name is Tanaka.'

(3) *Jibun chaa nomi-ika-hen?*
SELF tea drink-go-NEG
'Don't you come and have tea with me?'

(4) *Jibun-no tachiba-wo kangaero.*
SELF-GEN position-ACC think
'Think about your position' (lit.) ⇒ 'Who do you think you are?'

(1) exemplifies an emphatic use as in *John did it all by himself*; the referent of the subject can be anybody who utters this regardless of person or gender. In (2), *jibun* is used as a first-person singular pronoun; there is a regimental feel attached to this use, and is predominantly found among men in the police or military organizations, or athletes (especially those who practice martial arts). *Jibun* in (3), on the other hand, is used as a second-person singular pronoun; this use is found mainly in Kansai (= areas around Osaka and Kyoto) dialects. Superficially, (4) looks just like (3); I should think, however, that it is on a par with (1); as (4) is imperative, it can be regarded as having an implicit second-person singular subject and *jibun* refers back to it, as it were. Alternatively, (3) and (4) can be regarded as subcases of (1), for they seem to pick up a most prominent referent in the discourse, i.e. the speaker-cum-subject-expression in the declarative and the addressee-cum-subject in the interrogative or imperative, in order to emphasise its salience, but that would be beyond the scope of this paper.

In this paper, I shall try to explain the referential behaviour of *jibun*. After reviewing syntactic accounts, a simple solution is offered using context logic. This will explain the basic referential range of *jibun*. A similar effect can be achieved in an Optimality Theoretic approach, and this possibility is also explored.

2 (Mainly) Syntactic Accounts

2.1 Kameyama 1984

There have been many attempts to capture the behaviour of *jibun* by syntactic constraints. One such example, which is relatively comprehensive, is proposed by Kameyama (1984:228). She proposed that the antecedent for *jibun* (a) must be the subject of the sentence; (b) need not be in the same clause as *jibun*; (c) must 'command' *jibun*; and (d) must be animate. Such conditions alone cannot explain the following examples, however:

(5) *Taroo-ga* *Jiroo-ni* *jibun-no-koto-wo* *hanas-ase-ta.*
Taroo-NOM Jiroo-DAT SELF-GEN-COMP-ACC tell-PASS-PAST
'Taroo$_i$ had Jiroo$_j$ talk about self$_{i/j}$.'

(6) *Taroo-ga* *Jiroo-ni* *jibun-no-koto-wo* *hanasite-morat-ta.*
Taroo-NOM Jiroo-DAT SELF-GEN-COMP-ACC tell-BENE-PAST
'Taroo$_i$ benefited from Jiroo$_j$ talking about self$_{i/j}$.'

(7) *Taroo-ga* *Jiroo-ni* *jibun-to-sokkurina-otoko-ga-iru-koto-wo*
Taroo-NOM Jiroo-DAT SELF-COMP-resemble-man-NOM-exist-COMP-ACC
shiras-are-ta.
inform-PASS-PAST
'Taroo$_i$ was informed by Jiroo$_j$ of the fact that there is a man resembling self$_{i/j}$.'

(8) *Taroo-wa* *Jiroo-kara* *Saburoo-ga* *jibun-wo* *bengosuru-koto-wo* *kiita.*
Taroo-TOP Jiroo-from Saburoo-NOM SELF-ACC defend-NOM-ACC heard
'Taroo$_i$ heard from Jiroo$_j$ that Saburoo$_k$ would defend self$_{i/j/k}$ [in court].'

(9) *Taroo-wa* *Jiroo-ni* *Saburoo-ga* *jibun-wo* *nikundeiru-koto-wo* *kiita.*
Taroo-NOM Jiroo-DAT Saburoo-NOM SELF-ACC hate-NOM-ACC heard
'Taroo$_i$ heard from Jiroo$_j$ that Saburoo$_k$ hated self$_{i/j/k}$.'

(10) *Taroo-wa* *Jiroo-ni* *Saburoo-ga* *jibun-wo* *nikundeiru-koto-wo* *hanashita.*
Taroo-NOM Jiroo-DAT Saburoo-NOM SELF-ACC hate-NOM-ACC told
'Taroo$_i$ told Jiroo$_j$ that Saburoo$_k$ hated self$_{i/*j/k}$.'

(11) *Jibun-ga* *gandearu-toiu-shindan-ga* *Taroo-wo* *zetsuboo-ni-oiyatta.*
SELF-NOM has cancer-COMP-diagnosis-NOM Taroo-ACC despair-DAT-sent
'The diagnosis that self$_i$ has cancer made Taroo$_i$ despair.'

(5)–(7) may be explained by extending the condition (a): 'the sentence' can cover an embedded one as in the case of (5) and (6) or 'the subject' could be changed to 'the agent' as in (7). Others, however, do not seem to be accounted for by such modification. For instance, *Jiroo* in (8) and (9) is neither the subject nor the agent in any straightforward sense. In (10), on the other hand, the seemingly same *Jiroo* cannot act as the antecedent. Finally, in (11), there is no real antecedent, for *jibun* appears in the sentence-initial position.

To account for these examples, Kameyama (1984:230–1) revises her conditions, employing the following features:

[+/−sb] whether or not the antecedent must be a grammatical subject
[+/−ncl] whether or not the antecedent must be in the same clause nucleus as the anaphor
[+/−log] whether or not the anaphor must lie in an indirect discourse structure with respect to the antecedent that designates the "logophoric" subject

Logophoric pronouns, as originally proposed by Hagége (1974), are those pronouns which refer to the author of a discourse or someone whose thoughts are reported. Clements (1975:141) slightly extends this, stating that the antecedent of the logophoric pronoun must be "the individual (other than the speaker) whose speech, thoughts, feelings, or general state of consciousness are reported".

Following Clements, Kameyama's main proposal is that *jibun* has the disjunctive feature [+sb/+log]. In the version of Lexical Functional Grammar in which Kameyama's account is given, the deep-structure subjects of transformational grammar correspond to XCOMP SUBJ, i.e. the subject of an open complement, which has the feature [+sb]. This means that noun phrases (henceforth NPs) in the problematic examples will have the following features:

(8) Taroo [+sb]; Jiroo [+log]; Saburoo [+sb]

(9) Taroo [+sb]; Jiroo [+log]; Saburoo [+sb, +log]

(10) Taroo [+sb]; Jiroo OBJ2; Saburoo [+sb, +log]

(11) Taroo [+log]

The proposed feature can thus explain the fact that *Jiroo* cannot be the antecedent of *jibun* in (10). It should be noted here that by adding the feature [+log], Kameyama's account no longer remains purely syntactic.

So far so good. There are, however, examples that suggest it is not sufficient ((12) and (14) adapted from Masuko 1992; (13) and (15) based on Gunji 1987):

(12) *Hanako-wa* *Masako-ni* *jibun-ga* *kimeta-jikan-ni* *kuukoo-ni*
Hanako-TOP Masako-DAT SELF-NOM decided-time-at airport-to
mukaenikite-morat-ta.
come and meet-BENE-PAST
'Hanako$_i$ benefited from Masako$_j$'s coming to meet her at the time self$_{i/*j}$ had decided.'

(13) *Hanako-wa* *Masako-ni* *jibun-no-ie-de* *gochisoo-wo*
Hanako-TOP Masako-DAT SELF-GEN-house-LOC feast-ACC
youishite-morat-ta.
prepare-BENE-PAST
'Hanako$_i$ benefited from Masako$_j$'s preparing a feast at self$_{i/j}$'s house.'

(14) *Hanako-wa* *Masako-ni* *jibun-no-munenouchi-wo* *kiite-morat-ta.*
Hanako-TOP Masako-DAT SELF-GEN-feelings-ACC listen-BENE-PAST
'Hanako$_i$ benefited from Masako$_j$'s listening to how self$_{i/*j}$ felt.'

(15) *Hanako-wa* *Masako-ni* *jibun-no-ie-ni* *kaette-morat-ta.*
Hanako-TOP Masako-by SELF-GEN-house-to return-BENE-PAST
'Hanako$_i$ benefited from Masako$_j$'s returning to self$_{*i/j}$'s house.'

Kameyama's account, equipped with logophoricity, cannot explain these examples. Firstly, it will assign the feature [+sb] to *Hanako* in all examples. *Masako* will also be marked [+sb] as it is XCOMP SUBJ. It follows that both *Hanako* and *Masako* should be potential antecedents of *jibun* in (12)–(15). This is fine for (13) where either interpretation is possible. In (12) and (14), *jibun* has to be *Hanako*, but there is nothing in Kameyama's account to block *Masako* from becoming the antecedent. (15) will also be problematic because *jibun* would under normal circumstances refer back only to *Masako*. Kameyama will have to say *Hanako* can also be an antecedent as there is nothing in her account to block this.

2.2 Kuno 1978

Kuno(1978; see also Kuno & Kaburaki 1977) employs the notion of empathy in order to account for the referential behaviour of *jibun*. In this theory, there is strong preference for the subject to be the antecedent of *jibun*. Firstly, the use of numerous verbs of receiving in Japanese which function like an auxiliary implies that the referent of the subject benefited from the reported event: *morau* (literally "receive") is one such verb. Within Kuno's theory, this means that when it is used, the subject becomes the locus of empathy. He states also that the discourse topic is usually selected over a newly introduced character as the preferred centre of empathy. This means that in all of the examples (12)–(15), *Hanako* should be selected as the antecedent of *jibun*. Kuno's account will, therefore, fail to make the right prediction with respect to (15) and potentially (13).

2.3 Sells 1987

Sells (1987) offers an account of *jibun* in Discourse Representation Theory (henceforth DRT; see Kamp 1981 and Kamp & Reyle 1993). He rejects the view of logophoricity as a single, unified notion and proposes three primitive "roles" which he claims are responsible for the logophoric phenomena, i.e. SOURCE, SELF and PIVOT, which are defined as:

> The SOURCE is one who makes the reports (for example, the speaker). The SELF represents the one whose "mind" is being reported; the PIVOT represents the one from whose point of view the report is made (Sells 1987:455).
>
> SOURCE: one who is the intentional agent of the communication
> SELF: one whose mental state or attitude the content of the proposition describes
> PIVOT: one with respect to whose (space-time) location the content of the proposition is evaluated (Sells 1987:457).

These roles are assigned to the *external speaker* or *the internal protagonist*. The combinations of the assignment to each role form an implicational hierarchy (Sells 1987:456):

	Direct speech	3POV	Psych-verb	"Logophoric" verb
SOURCE	external	external	external	internal
SELF	external	external	internal	internal
PIVOT	external	internal	internal	internal

This is based on the classification of "discourse environments". The "logophoric" environment is typically introduced by verbs of saying, and psych-verb such as *distress*. Sells does not explicate what exactly he means by the "direct speech" environment, though he states that "3POV" (i.e. third-person point of view)

> . . . is not lexically determined by a particular embedding predicate but instead arises constructionally (for example, because a particular interpretation is adopted, or forced in certain cases, compatible with the meaning of a subordinating adverbial conjunction): the external speaker chooses to take the point of view of an internal protagonist (Sells 1987:458).

This suggests that the "3POV" is not (and probably cannot be) defined formally.

There are more problems with Sells' account. Stirling (1988) provides fairly comprehensive discussion of the major problems: i.e. lack of generality and technical specificity, and the inadequate motivation for proliferating semantic primitives. Masuko (1992) casts doubt on the grammaticality of the examples and their interpretations he offers, and points out further problems with his "roles". Most problems seem to arise from Sells' definition of "point of view" (i.e. PIVOT) as a physical location, and if this is rejected and PIVOT is regarded as mental, then it cannot and perhaps should not be distinguished from SELF. SOURCE becomes important when the external speaker is involved, but Sells (1987) does not present any relevant examples. The theoretical status of these "roles" is not made clear, but if they are to be treated as ordinary discourse markers, then Sells will have problems with the negated predicate, for it would *ipso facto* deny the existence of SOURCE (cf. Clements 1975:170; Stirling 1988:268). Another problem is that PIVOT should supposedly always bind *jibun* according to Sells (1987:468), but it may not in the case of some psych-verb environments.

From these discussions, it would be reasonable to conclude that Sells' (1987) three "roles" lack motivation. Nevertheless, let us see what prediction this account might make in relation to the problematic (13) and (15) above. Assuming that *morau*, an empathy-oriented auxiliary, counts as one of "logophoric" verbs, the assignments of the "roles" will be as follows:

(13) SOURCE = Hanako; SELF = Hanako; PIVOT = Hanako

(15) SOURCE = Hanako; SELF = Hanako; PIVOT = Hanako

Thus, Sells (1987) would fail to make the right predictions with regard to these examples.

2.4 Discussion

Three mainly syntactic accounts were examined in the previous subsections and they all fail to make right predictions about the referential range of *jibun*. This is because to determine the referent it is necessary to take into account contextual plausibility, on top of its preference for the referent of the subject expression and the logophoric entity. That is, the main reason why *jibun* should refer to *Hanako* in (12) and (14) is because that interpretation is contextually plausible. It is more convenient for *Hanako* if she can decide the time *Masako* comes to pick her up in (12), and *Hanako* can feel better by having had *Masako* listening to her feeling in (14). Also, it would be rather strange for *Hanako* to tell *Masako* how *Masako* feels. Similarly, *Masako* is *jibun*'s strongly-preferred antecedent in (15) because of contextual plausibility: *kaeru* "return" is agent-oriented and it would be natural to assume *Masako* went back to her own house. And *jibun* in (13) can refer to either because *Hanako* could benefit from the event described wherever cooking was done. Syntactically-oriented accounts, by definition, have no room for contextual plausibility, and they will fail when that notion needs to be invoked.

For the benefit of non-native speakers of Japanese, it should perhaps be pointed out at this point that *jibun* can in some cases refer to the speaker (or the author) of the entire sentence: that interpretation is rather likely in the case of (12) and possibly also (13), but it is possible in almost any sentence involving *jibun*. This may be accounted for if the notion of logophoricity is somehow extended but it is difficult to conceive how; and it still remains essential to explicate contextual plausibility, for *jibun* does not always refer to the speaker/author.

3 Logics of Context

The discussion so far has shown that the referential range of *jibun* cannot be accounted for simply by syntactic constraints and that adding some semantic/pragmatic factors to a basically syntactic explanation is insufficient. Approximately twenty years have passed since Kameyama and Kuno made their proposals, and yet no recent syntactic accounts contain any more plausible arguments. What is required is some mechanism that can represent "context" properly and can explain how plausibility is computed.

For this purpose, attempts by Artificial Intelligence researchers to formalise the notion of context appear useful. There are several different versions of logics of context and most of them are propositional: representative theories will be reviewed in this section.

3.1 McCarthy's Logic of Context

The most widely used framework is the one proposed by John McCarthy (e.g. McCarthy 1983, 1996; McCarthy & Buvaç 1997; Guha & McCarthy 2003). This work, however, as its main proponent admits, remains "incomplete and tentative" (McCarthy & Buvaç 1997:14; see de Paiva 2003 for more problems related to formalisation).

In this framework, contexts are regarded as abstract, formal objects: they are also said to be "*rich* objects, like situations in situation calculus" (McCarthy & Buvaç 1997:15) but no explica-

tion is offered as to what is meant by this. Hence, I shall only present how this logic is said to work, concentrating on notation.

Firstly, $ist(c, p)$ means 'the proposition p is true in the context c'. $Value(c, e)$, on the other hand, designates the value of a term e in the context c. Thus, $value(c, x) = y \equiv (\forall z)y = z \equiv ist(c, x = z)$ iff all contexts have the same domain.

One important notion in this theory is *transcending* contexts, which makes it possible to account for more than one subject. This is represented as $c' : ist(c, p)$: i.e. the proposition p is in the context c, and this is asserted in an outer context c'. In addition, in order to explain reference relations in multiple contexts, it is necessary to *enter* and *exit* contexts. The outer context is $c0$, and if $c0$: $ist(c, p)$, by entering the context c, it can be inferred that $c : p$. And by reversing the process, if we have $c : p$, we can infer $c0$: $ist(c, p)$ by EXITing the context c.

I shall merely point out at this stage that the notion of 'outer context' (i.e. $c0$ in McCarthy & Buvaç 1997) seems an appropriate means to represent the above-mentioned possibility of *jibun* referring to the speaker of an utterance or author of an entire sentence. Another useful feature is its capacity of allowing different vocabularies in different contexts.

3.2 Attardi & Simi 1993

Attardi & Simi (1993) explicate viewpoints using a reflective first order logic that is proved to be consistent. In this framework, a viewpoint is seen as a set of sentences that represent the assumptions of a theory. Thus, in their notation, $in('A', vp)$ means that a sentence A is entailed by the assumptions denoted by a viewpoint expression vp. Belief, reflection, truth and knowledge (= true belief) are defined as follows (Attardi & Simi 1993:15f):

BELIEF	$Bel(g, A) = in(A, vp(g))$ where g is an agent.
	Reflection $in(A, vp) \Rightarrow (vp \Rightarrow A)$
TRUTH:	$True(A) = in(A, RW)$ where RW is a special theory called **Real World**
	that represents the real world we live in. Thus, $in(in(A, RW), vp) \Leftrightarrow in(A, vp)$
KNOWLEDGE:	$K(g, A) = Bel(g, A) \wedge True(A) = in(A, vp(g)) \wedge in(A, RW)$.
	Thus, $K(g, A) \Rightarrow A$

It should be clear from the above that truth is relative in this theory. Provability in a viewpoint is called holding in a situation, which is represented as: $Hold(A, s) = in(A, vp(s))$, where s is a situation, and a viewpoint $vp(s)$, which is a set of basic facts which define the situation.

With this mechanism, Attardi and Simi can represent contexts with viewpoint as $ist(c, p) = in(p, c)$, i.e. the proposition p is true in the context c. This, however, does not allow differences in vocabularies in different contexts, which is allowed in McCarthy's theory.

3.3 Ghidini & Giunchiglia 2000, 2002

Ghidini & Giunchiglia (2000, 2002) advocate a framework called Local Models Semantics (LMS). In this system, a context is seen as a partial and approximate representation of the world from some agent's perspective: i.e. it does not belong to the real world, as it were, but represents the world from some individual's viewpoint. Thus, reasoning is partial in a sense that it only involves a subset of the individual's knowledge and also that not all inference patterns will be used. This does not mean, however, that different contexts are unrelated. Ghidini and Giunchglia's argument is that such relationships between different contexts are deemed to be partial and we cannot

fully 'translate' one context into another: a single representation of the real world is in principle not feasible.

Such intuitions are expressed as the following two principles:

> Principle 1 (of Locality): reasoning uses only part of what is potentially available (e.g., what is known, the available inference procedures). The part being used while reasoning is what we call *context*;
>
> Principle 2 (of Compatibility): there is compatibility among the reasoning performed in different contexts. (Ghidini & Giunchiglia 2002:2)

More formally, $\{L_i\}_{i \in I}$ is defined as a family of languages defined over a set of indexes I. In order to pair local models into a single uniform structure, a notion of a compatibility sequence $\mathbf{c}$ is defined as $\langle \mathbf{c}_0, \mathbf{c}_1, \ldots, \mathbf{c}_i \ldots \rangle$. A model in this framework is a compatibility relation $\mathbf{C}$ which has the following characteristics:

1. $\mathbf{C} \neq 0$
2. $\langle 0, 0, \ldots, 0, \ldots \rangle \notin \mathbf{C}$
   (Ghidini & Giunchiglia 2002:4)

Satisfiability then can be defined as follows:

> Let $\mathbf{C} = \{\mathbf{c}\}$, with $\mathbf{c} = \langle \mathbf{c}_0, \mathbf{c}_1, \ldots, \mathbf{c}_i, \ldots \rangle$, be a model and $i : \phi$ a formula. $\mathbf{C}$ satisfies $i : \phi$, in symbols $\mathbf{C} \models i : \phi$, if for all $\mathbf{c} \in \mathbf{C}, \mathbf{c}_i \models \phi$ where if, for all $m \in \mathbf{c}_i, m \models_{cl} \phi$. (Ghidini & Giunchiglia 2002:7–8)

Furthermore,

> A formula $i : \phi$ is valid, *in symbols* $\models i : \phi$, if all models satisfy $i : \phi$.

Ghidini & Giunchiglia (2000:30f) provide proofs that their system that allows multiple contexts, *Multicontext system*, is complete and sound with respect to a certain model.

Ghidini and Giunchiglia's view of context as a partial representation of the world seems suitable for representing natural language utterances and their interpretations. Their system, however, is rather too complicated: allowing multiple contexts would not be necessary when analysing utterances unless we are interested in representing, say, both the speaker's and the addressee's contexts, and this is not how analyses are normally done by linguists.

3.4 Buvaç & Mason 1993

Buvaç & Mason (1993) (see Buvaç et al. 1995) propose a logic that formalises McCarthy's theory of context, which is called Propositional Logic of Context (henceforth PLC). Buvaç & Mason (1993) show that their logic is complete and sound.

Supposing that contexts can be denoted by labels, a set of such labels $\mathbb{K}$ and a set of atomic propositions $\mathbb{P}$, together with the modality $ist(\kappa, \phi)$ for each $\kappa \in \mathbb{K}$. A set of well-formed formulae $\mathbb{W}$ will be

$$\mathbb{W} := \mathbb{P} \cup (\neg\mathbb{P}) \cup (\mathbb{P} \subset \mathbb{P}) \cup ist(\mathbb{K}, \mathbb{P})$$

In order to express a context seen from another context, sequences of contexts are defined as follows. Supposing $\mathbb{K}^*$ denote the set of finite context sequences and $\overline{\kappa} = \kappa_1 \ldots \kappa_n$ denote any element of $\mathbb{K}^*$. Then a vocabulary Vocab($\overline{\kappa}, \phi$) can be defined as $\{\langle \overline{\kappa}, p \rangle\}$

A model $\mathcal{M}$ will then be defined as a relation between a set of partial truth assignments to context sequences (Bouquet & Serafini 2000:12):

> $\mathcal{M} \in (\mathbb{K}^* \rightarrow_p \mathbf{P}(\mathbb{P} \rightarrow_p \{\text{true,false}\}))$ where $A \rightarrow_p B$ denotes a set of partial functions from A to B and $\mathbf{P}(A)$ denotes the powerset of A.
>
> ϕ is *valid* in a context sequence $\overline{\kappa}$ if $\models_{\overline{\kappa}} \phi$; ϕ is *satisfiable* in a context sequence if there is a PLC-model $\mathcal{M}$ such that $\mathcal{M} \models_{\overline{\kappa}} \phi$.

Bouquet & Serafini (2000) observe that LMS is more general than PLC (see Buvaç & Mason 1993:23), for the latter can be embedded in the former. Furthermore, they state that PLC with different vocabularies for different contexts is equivalent to PLC with a single vocabulary for all contexts. Even if their argument is correct, it does not follow that McCarthy's theory of context in itself is incapable of allowing different vocabularies. And as we have seen in 3.1, McCarthy's own work makes it clear that the converse is true. There is a far more problematic issue concerning the axiom, Δ, which enables one knowledge base to access another knowledge base and which, as a result, might deny partiality that underlies the theory. As this is more of a logical problem and it is possible to have a propositional logic of context without the axiom, I shall not discuss this further: see de Paiva (2003) for a more detailed discussion.

3.5 Buvaç 1995

Buvaç (1995) offers an account of lexical ambiguity which is based on McCarthy's theory of context. He provides a proof theory that has the following properties:

(K) $\vdash \kappa : ist(\kappa', \phi \rightarrow \psi) \rightarrow (ist(\kappa', \phi) \rightarrow ist(\kappa', \psi))$
[Every context is closed w.r.t. logical consequence.]

(Δ) $\vdash \kappa : ist(\kappa_1, ist(\kappa_2, \phi) \vee \psi) \rightarrow ist(\kappa_1, ist(\kappa_2, \phi)) \vee ist(\kappa_1, \psi)$
[Contextual omniscience]

(Flat) $\vdash \kappa : ist(\kappa_2, ist(\kappa_1, \phi)) \rightarrow ist(\kappa_1, \phi))$
[Every context looks the same regardless of which context it is being viewed from.]

(Enter) $frac\vdash \ \kappa' : ist(\kappa, \phi)\vdash \kappa : \phi$

(Exit) $\frac{\vdash \kappa : \phi}{\vdash \kappa' : ist(\kappa, \phi)}$

The Δ axiom, as mentioned in Section 3.4., is controversial, and so is Flatness. As the logic without these two axioms is conceivable, this does not count as a real obstacle for using the theory for natural language semantics.

3.6 Discussion

This section briefly examined three different frameworks. Each of them has potential problems if used for analysing natural language utterances. One reason for this is none of the above-mentioned theories incorporates quantification. Another issue is they have rather different logical properties and are not strictly comparable. For instance, Buvaç & Mason (1993) use modal logic. Ghidini and Giunchiglia's theory (2000; 2002) is centred on the concepts of locality and

compatibility whilst McCarthy's original theory is couched in the predicate *ist*, which is basically validity.

More research is required to decide which framework is most appropriate for analysing and representing natural language semantics. In this paper, I shall use McCarthy's theory as exemplified by, say, Buvaç (1995), for it seems simpler and easier to understand than others, which makes it intuitively appealing.

4 Contextual Plausibility and Referential Range of *Jibun*

4.1 Contextual Plausibility in a Context Logic

This section will show how the referential range of *jibun* can be represented using a context logic. The account given here will no doubt appear too simplistic, and should not be taken as definitive.

As discussed in Sections 1 and 2, *jibun* can basically refer to the speaker of, or any single human being mentioned in, an utterance containing it if and only if s/he is (i) an agent of an event denoted by the utterance or (ii) a source of information, called the logophoric subject. As the agent is usually linguistically realised as the subject, the broadly conceived notion of *subject* will cover the primary referential range of *jibun*. When more than one such subject is present, other linguistic expressions and the context, linguistic and otherwise, will impose preference ordering: an individual that appears the most plausible referent will be selected.

Among predicate expressions, the so-called verbs of giving and receiving and coming and going impose strong preference for reference selection. When a verb of receiving, e.g. *morau*, is included in the predicate, either as the main verb or as an auxiliary, the subject will be strongly preferred as *jibun*'s referent. *Mutatis mutandis* with a verb of giving. When either is combined with verbs of coming and going, the latter will take precedence and the agent of coming or going will be selected as the antecedent. (12)–(15) above are repeated here for convenience:

(12) *Hanako-wa* *Masako-ni* *jibun-ga* *kimeta-jikan-ni* *kuukoo-ni*
Hanako-TOP Masako-DAT SELF-NOM decided-time-at airport-to
mukaenikite-morat-ta.
come and meet-BENE-PAST
'Hanako$_i$ benefited from Masako$_j$'s coming to meet her at the time self$_{i/*j}$ had decided.'

(13) *Hanako-wa* *Masako-ni* *jibun-no-ie-de* *gochisoo-wo*
Hanako-TOP Masako-DAT SELF-GEN-house-LOC feast-ACC
youishite-morat-ta.
prepare-BENE-PAST
'Hanako$_i$ benefited from Masako$_j$'s preparing a feast at self$_{i/j}$'s house.'

(14) *Hanako-wa* *Masako-ni* *jibun-no-munenouchi-wo* *kiite-morat-ta.*
Hanako-TOP Masako-DAT SELF-GEN-feelings-ACC listen-BENE-PAST
'Hanako$_i$ benefited from Masako$_j$'s listening to how self$_{i/*j}$ felt.'

(15) *Hanako-wa* *Masako-ni* *jibun-no-ie-ni* *kaette-morat-ta.*
Hanako-TOP Masako-by SELF-GEN-house-to return-BENE-PAST
'Hanako$_i$ benefited from Masako$_j$'s going back to self$_{*i/j}$'s house.'

In these examples, the likely referent of *jibun* will be computed in the following manner:

(12) *morau* 'receive' → orientation toward the subject/goal [= Hanako]
mukaeni-kuru 'come and meet'
→ orientation toward the object/goal [= Hanako]

∴ Hanako will be selected as the likely referent.

(13) *morau* 'receive' → orientation toward the subject/goal [= Hanako]
no other preference expressions

∴ Hanako will be a more likely referent, though other possibilities are available.

(14) *morau* 'receive' → orientation toward the subject/goal [= Hanako]
munenouchi-wo kiku 'listen to one's feelings' →
the speaker would feel relieved [= Hanako]

∴ Hanako will be selected as the likely referent.

(15) *morau* 'receive' → orientation toward the subject/goal [= Hanako]
ie-ni kaeru 'return to house' → 'go home'
→ the only possibility = the subject [= Masako]

∴ Masako will be selected as the referent.

This can be represented as a sort of partial preference order among verbs:

RETURNING $\prec$ GIVING/RECEIVING $\preceq$ COMING AND GOING $\prec$ 'LOGOPHORIC'
[including the 'external speaker' case]

Representing events in a manner similar to that of Parsons (1990) and using a context logic used in Buvaç (1995), the inference mechanism for the likely referent of *jibun* can be given. From the above examples, I shall use (13) and (15) as illustrations, for they proved problematic for the theories examined in Section 2: I shall ignore the possibility of the external speaker being the referent of *jibun*. Here the predicate BENE is used to express the benefit conveyed by the use of *morau* 'receive':

(13) $ist(c0, \textit{jibun} = \text{SUBJECT})$

c_d: $(\exists e)[\text{Agent}(e, x) \wedge \text{REPORTING}(e) \wedge (\exists e')[\text{BENE}(e', \text{Hanako}) \wedge (\exists e'')$
$[\text{Preparing-a-feast}(e'') \wedge \text{Agent}(e'', \text{Masako}) \wedge \text{LOC}(e'', \text{JIBUN's house})] \wedge \text{CAUSE}(e'', e')]]$

$C_{common-sense}$: $\text{prepare-a-feast}(x, t) \Rightarrow \forall x[\text{Agent}(x) \wedge \exists l[\text{at}(x, l) \wedge l = \text{JIBUN's house}]$

RECEIVING $\prec$ OTHER PREDICATES

∴ *jibun's* house = Hanako's house $\preceq$ Masako's house

(15) $ist(c0, \textit{jibun} = \text{SUBJECT})$

c_d : $(\exists e)[\text{Agent}(e, x) \wedge \text{REPORTING}(e) \wedge (\exists e')[\text{BENE}(e', \text{Hanako}) \wedge (\exists e'')[\text{Returning}(e'') \wedge$
$\text{Agent}(e'', \text{Masako}) \wedge \text{GOAL}(e'', \text{JIBUN's house})] \wedge \text{CAUSE}(e'', e')]]$

$C_{common-sense}$: $\text{return}(x, y, t) \Rightarrow \forall xy[\text{Agent}(x) \wedge Goal(y) \wedge \exists t'[\text{at}(x, y, t') \wedge t' < t < \text{now}]$

RETURNING $\prec$ RECEIVING $\prec$ OTHER PREDICATES

∴ *jibun*'s house = Masako's house

The preference relations above could be formalised and incorporated in the logical system. As the order is currently expressed in terms of the predicate used in the utterance, however, it seems preferable to regard it as outside the logic per se.

4.2 An Optimality-Based Account

The previous subsection was an attempt to offer the preference order among the referential candidates for *jibun* within a context logic. This was necessary because there usually are more than one entity that could conceivably be coreferential with *jibun*. Idiolectal and/or dialectal variations among speakers can be dealt with by changing the order. A similar result may be more elegantly achieved by casting this in Optimality Theory (cf. Prince & Smolensky 1993/2002) because in this framework a grammar is seen as a set of constraints which may be violated and which form language-specific hierarchies: such hierarchies can be modified and regarded as idiolect- and/or dialect-specific.

Hendriks & de Hoop (2001) argue for Optimality Theoretic Semantics, for it can avoid some problems associated with compositionality by incorporating certain contextual information. For instance, they propose that the following pragmatic constraint, originally proposed by Williams (1997), serves as the basis to capture anaphoric relations among NPs:

> *DOAP*: Don't Overlook Anaphoric Possibilities. Opportunities to anaphorize text must be seized. (Hendriks & de Hoop 2001:15; their (20))

Another pragmatic constraint is generally observed in the case of anaphora:

> *Topicality*: As the antecedent of an anaphoric expression, choose a topic. (Hendriks & de Hoop 2001:18: their (27))

There is nothing particularly innovative or controversial with this: a similar notion can be found in practically any theory of anaphoric resolution.

As these constraints have to do with interpretation, they are seen as weaker than the syntactic binding principles, which will determine the basic referential range of NPs. It seems uncontroversial to argue that NPs in a given language form an implicational hierarchy (see, for instance, Bresnan (2001) and references therein). Since the topic of this paper is the referential range of *jibun*, we shall concentrate on coreference only.

Hendriks & Spenader (2004:2), quoting Burzio (1998) replace the orthodox Binding Theory with the following soft constraints:

> Principle A: A reflexive must be bound locally
> *Referential Economy*: a >> b >> c
> a: bound NP = reflexive
> b: bound NP = pronoun
> c: bound NP = R-expression

Burzio (1998:93) takes "reflexives to have no inherent referential content, pronouns to have some, and R-expressions to have full referential content"; this seems reasonable with respect to anaphoric relations. Thus, *Referential Economy* states that an NP with less content should be preferred for coreference. Hendriks & Spenader (2004:3) generalize this constraint as

Referential Economy:
Avoid R-expressions >> Avoid pronouns >> Avoid reflexives

Although these two constraints work for English, they won't do for Japanese as *jibun* does not have to be locally bound. Thus, Principle A is not applicable and the hierarchy for *Referential Economy* needs to be amended. Reduced pronominals, if available, are universally used to mark topic anaphoricity, and in languages such as Japanese, zero is the most preferred option (see Kameyama 1985; Bresnan 2001). So-called personal pronouns behave rather differently as well, to which I shall come back shortly.

The following hierarchy is suggested by Masuko (1992:54) in order to account for coreference relations in Japanese:

Non-reflexive pronouns > {Lexical NPs, *Zibun*} > Zero

Lexical NPs here mean the same as R-expressions. The NPs are ordered according to informational content and in the decreasing order; lexical NPs and *jibun* are not ordered because in my idiolect which of these two should be selected depends on linguistic and/or extralinguistic contexts of a particular utterance. For many native speakers of Japanese born and bred in Kanto area (i.e. around Tokyo) who are in their thirties or older, so-called third-person pronouns in Japanese carry pragmatic overtones which should be avoided (see Bresnan 2001:21, fn. 15), and pragmatic (and possibly other) factors are involved when choosing one from a variety of first- or second-person pronouns. All in all, this means some speakers do not use third-person pronouns to signal coreference.

In a default case, *jibun* will be selected over ordinary NPs, and the above hierarchy can be changed to model on Hendriks and Spenader's:

Referential Economy for Japanese

Avoid pronouns >> Avoid R-expressions >> Avoid *jibun* >> Avoid Zero

In this paper, however, we are interested in the referential range of jibun and not in which NP will be the preferred expression for indicating coreference relations. Thus, Referential Economy is irrelevant here. More pragmatic constraints are needed to account for the problematic cases:

Emphatic Predicate (EP) 1 (*kaeru*): Subject/Agent >> Others

Emphatic Predicate (EP) 2 (*morau*): Subject/Goal >> Others

Contextual Plausibility (CP): The contextually plausible antecedent will be chosen over the other candidates.

External Speaker (ES): *External speaker* doesn't have to be preferred as the potential antecedent for coreference unless there is some specific reason for doing so.

Normally, the following preferential order obtains among constraints for coreference relations in Japanese:

Referential Economy >> CP >> Emphatic Predicate >> External Speaker

The possibility of the external speaker being the antecedent will not be considered here, for this is not very likely in the examples at hand. We shall use pragmatic constraints to decide which R-expression will be the preferred antecedent. Using the tableaux, all the relevant constraints and their results can be represented as follows:

(13) INPUT: coreference	*EP2*
☞*Hanako*	
Masako	*!

(13′) INPUT: coreference	*CP*	*EP2*
Hanako	*!	
☞*Masako*		*

(15) INPUT: coreference	*CP*	*EP1*	*EP2*
Hanako	*!	*	
☞*Masako*			*

In the case of (13), *Contextual Plausibility* can be ignored. As *Masako* violates *EP2*, *Hanako* will be selected as the preferred antecedent, and this is shown in the first tableau. There is another possibility, however. It is possible to conceive contextually plausible assumptions that obtain in the situation where (13) is uttered. Deciding what will arise and which will be stronger than others would require further contextual information, linguistic and otherwise. Nevertheless, it seems feasible to say that the following two would be among the foremost possibilities: (i) having the feast prepared at her own house is more convenient to Hanako as she wouldn't have to go anywhere and (ii) cooking in her own kitchen is easier for Masako. If some contextual information dictates that *CP* (ii) should take precedence over (i), e.g. Hanako would not like anyone else to use her kitchen as she doesn't want her kitchen to be a mess of unwashed pots and pans, then *Masako* will be chosen as the antecedent as in (13′). *CP* is ranked higher than *EP2* and the violation of the former is worse than that of the latter. With (15), on the other hand, the decision can be made more straightforwardly. *Hanako* violates *CP* and this is bad enough, for, as already mentioned, it would be rather strange if Masako went home and that was actually Hanako's house. Hence, *Masako* will be the preferred antecedent.

5 A Provisional Conclusion

This paper examined the referential range of *jibun* and offered a provisional account couched in a logic of context. The basic argument offered is though *jibun* can in principle refer to any individual expressed as the subject (including the speaker of the utterance containing it, who is called the *external speaker*), depending on other expressions present in the same utterance and/or common-sense information pertaining to the event expressed, a certain individual may be preferred as a more likely referent than the other(s). A simplistic version of context logic is used to represent inferential processes in Section 3. A similar account is couched in Optimality Theoretic account in Section 4

Obviously, more work is needed to decide whether context logic is preferable to Optimality Theory or vice versa. Linguistically, dialectal and/or idiolectal differences are prevalent with regard to the use of *jibun*. This suggests that a theory of *jibun* should be flexible enough to

account for such variations. Either of the approaches can handle this. Each of them, however, will have to tackle different problems.

Selection among different context logics requires further research, though a simple logic such as McCarthy's and his associates' seems sufficient; and the discussion in 3.6 and 4.1 should have made this clear. Moreover, apart from having desirable logical properties such as completeness and soundness, a logic for natural language semantics should be as simple as possible. This is partly because the full power of higher-order logics is usually not required to treat natural language expressions and partly because complex logics are hard to understand and use for linguistic semanticists.

With respect to Optimality Theory, deciding what pragmatic constraints will be required and/or deciding the exact order among such constraints appears rather arbitrary. This is perhaps inevitable because hierarchies of constraints are language-specific and different constructions require different constraints and, of course, different hierarchies. How bad the violation of a certain constraint will have to be for an expression to be ruled out remains rather vague as well.

We have seen that the two approaches can incorporate contextual plausibility if it is to be seen as a collection of constraints required by linguistic expressions used. Even though I am not certain whether the formulations in 4.1 and 4.2 are appropriate for this purpose, it is hoped that they indicate the direction to be pursued. Perhaps a different mechanism such as prioritized circumscription (McCarthy 1986; cf. McCarthy 1980) is needed to specify which formula or constraints are relevant for a specific analysis or can safely be ignored. Moreover, explicating notions such as newsworthiness or salience (see Masuko 2003 and references therein) will eventually become necessary even though such notions are inherently difficult to pin down. It is hoped that collaboration among AI researchers, logicians and linguists will generate a framework which is easy to use and understand so that it will facilitate further research.

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BARE NOUNS AND GENERICS

GENERAL NUMBER AND THE SEMANTICS AND PRAGMATICS OF INDEFINITE BARE NOUNS IN MANDARIN CHINESE

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1 Introduction

Like many other languages, Mandarin Chinese has noun phrases consisting of just a BARE NOUN without any functional elements such as determiners, numerals, or classifiers:[1]

(1) *Zuótiān wǒ mǎi le* ***shū.***
yesterday I buy ASP book
'Yesterday, I bought one or more books.'

One striking property of bare nouns is that semantically they are neither singular nor plural, but somehow "neutral" or "unspecified" for number, as suggested by the somewhat cumbersome English translation 'one or more books' (cf. Krifka 1995, 2003; Chierchia 1998a,b, among others). Following Corbett (2000) we will say that bare nouns in Mandarin have GENERAL NUMBER.

In this paper we investigate semantic and pragmatic properties of bare nouns in Mandarin Chinese, restricting ourselves to bare nouns with an existential interpretation, as in (1). (Bare nouns in Mandarin can also have definite and generic interpretations, which we will mostly ignore in this paper. See (5)–(8) below for some examples.) In particular, we will address the question how indefinite bare nouns differ from what we will call INDEFINITE FULL DPS, such as English *a book* and *some books*, or their counterparts in Mandarin *(yī) běn shū* 'a/one book' and *yìxiē shū* 'some books':

(2) *Zuótiān wǒ mǎi le* ***(yī) běn shū.***
yesterday I buy ASP one CL book
'Yesterday, I bought a/one book.'

(3) *Zuótiān wǒ mǎi le* ***yìxiē shū.***
yesterday I buy ASP some book
'Yesterday, I bought some books.'

[1] Bare nouns may have modifiers such as adjectives or relative clauses, but we will not discuss these in this paper.

In contrast to bare nouns, the indefinite full DPs in (2) and (3) do not have general number. As we will show below *(yī) běn shū* 'a/one book' is semantically singular, and *yìxiē shū* 'some books' is semantically plural.

The indefinite singular in (2) consists of the numeral *yī* 'one' followed by a classifier followed by the noun. This DP is the functional equivalent of *one book* or *a book* in English. The sequence *yī běn* 'one + classifier' corresponds to the English *one* when *yī* is stressed, and to the English determiner *a(n)* when *yī* is unstressed. When unstressed, the numeral *yī* 'one' can be omitted.[2] However, when used in contrast to some other numeral classifier sequence, *yī* + classifier is always stressed and means 'one'. In that case, the numeral *yī* 'one' cannot be omitted. Thus there is the following rough correspondence between singular indefinites in Mandarin and English:

(4) $\left.\begin{array}{ll} \text{stressed } yì & + \text{ classifier} + \text{N} \\ \text{unstressed } yì & + \text{ classifier} + \text{N} \\ \varnothing & + \text{ classifier} + \text{N} \end{array}\right\} \approx$ *a(n)* N

Yìxiē shū 'some books' in (3) on the other hand is a semantically plural indefinite full DP.[3]

Before we continue, let us note that bare nouns in Mandarin (and other languages) can have other interpretations than the indefinite one illustrated in (1). As is well known, they can also be generic or definite (Cheng & Sybesma 1999; Yang 2001, among many others), depending on a number of factors including the position of the noun phrase (preverbal or postverbal). The examples in (5)–(8) from Yang (2001) illustrate this. However, in this paper, we will only be concerned with the indefinite interpretation of bare nouns.

(5) *Gǒu juézhǒng le.*
dog extinct ASP
'Dogs are extinct.'

(6) *Gǒu shì bǔrǔdòngwù.*
dog be mammal
'Dogs are mammals.'

(7) *Gǒu hěn jīling.*
dog very smart
i. 'Dogs are intelligent.' ii. 'The dog(s) is/are intelligent.'

(8) *Wǒ kànjiàn gǒu le.*
I see dog ASP
i. 'I saw some dog(s).' ii. 'I saw the dog(s).'

[2]Deletion of *yī*, as Yang (2001) argues, is restricted by the fact that in Mandarin classifiers are either suffixes or clitics, hence must be attached to a preceding host word. It then follows that *yī* can not be omitted when the containing DP occurs in a sentence-initial position, or when intervening material prevents the classifier from cliticizing onto an appropriate host word.

[3]It would be tempting to analyze *yixie* 'some' as consisting of the numeral *yī* 'one' plus a classifier *xiē*. However, as Marie-Claude Paris has pointed out to us, this can't be the correct analysis because *xiē* can co-occur with a classifier and therefore can't itself be a classifier: *zhè xiē xiāng píngguǒ* (this some CL apple) 'these boxes of apples'.

The structure of this paper is as follows. In the first part of the paper (sections 2 and 3) we provide some background discussion about the notion of general number. In section 2 we argue that nouns with general number are not ambiguous between a singular and a plural reading, but are truly number neutral. In section 3 we adopt a crosslinguistic perspective and explore the typology of nominal number. The second part of the paper (sections 4–7) is concerned with the semantic and pragmatics properties of indefinite bare nouns in Mandarin. It starts out with the observation that sentences like (1) in which the object has general number actually have the same truth conditions as sentences with a semantically singular indefinite full DP, such as (2) (section 4). This raises the question exactly what difference in meaning there is between bare nouns with general number and indefinite full DPs. One way in which indefinite bare nouns differ from indefinite full DPs is in their scope, a well-known issue since Carlson's groundbreaking work on English bare plurals. We review the scope facts for Mandarin Chinese in section 5. In section 6, we then turn to another difference between indefinite bare nouns and indefinite full DPs, namely the kind of discourse anaphora they allow. Finally in section 7, we discuss differences having to do with scalar implicatures.

2 Nouns with general number are not ambiguous

It is important to emphasize that a noun with general number is not ambiguous between a singular and a plural reading. (1) for instance is not ambiguous between one reading on which it means 'Yesterday I bought a book' and another reading which means 'Yesterday I bought books.' Rather, the sentence is unambiguous and has a single meaning which in English can only be paraphrased by means of a circumlocution such as 'Yesterday I bought one or more books.' In the case of Mandarin, evidence for this claim comes from traditional ambiguity tests (Zwicky & Sadock 1975; Cruse 1986). To see how such tests work, consider the English word *pen* which is ambiguous between the senses 'writing implement' and 'enclosure' (as in *pig pen*). In a conjoined sentence with VP deletion in the second conjunct, such as (9a), the deleted occurrence of the noun in the second conjunct must always be interpreted with the same sense as its antecedent:

(9) a. John saw a pen and Mary did too.

b. John saw a pen and Mary saw one too.

Therefore (9a) can mean either 'John saw a writing implement and Mary also saw a writing implement' or 'John saw an enclosure and Mary also saw an enclosure'. Crucially, the sentence cannot mean 'John saw a writing implement and Mary saw an enclosure', or 'John saw an enclosure and Mary saw a writing implement.' That is, the sentence has only two of the four logically possible interpretations. The same is true for examples with *one*-pronominalization such as (9b). Contrast this with a word like *child* which is truly unspecified as to the sex of its referent. The noun *child* obviously is not ambiguous between a reading on which it means 'girl' and another reading on which it means 'boy'; it simply can apply to underaged persons of either sex. (Of course the word *child* may be ambiguous in other ways, but the point is that it is not ambiguous with respect to the male/female distinction.) Now take (10a) and (b):

(10) a. John saw a child and Mary did too.

b. John saw a child and Mary saw one too.

These sentences can be true in situations of four different types: in situations in which John and Mary both saw a girl or John and Mary both saw a boy, but also in situations in which John saw a boy and Mary a girl, or vice versa. The children that John and Mary saw do not have to be of the same sex. Note by the way that crucially we do not claim that (10a) and (b) are four-ways ambiguous – both sentences have only one reading which is completely neutral as to the sex of the children involved.

Although Mandarin does not have VP deletion in this type of sentence, it does have a functionally equivalent construction in which the object is deleted while the verb is retained, as in (11a,b):

(11) a. *Wǒ yǒu tiě fànwǎn. Yuēhàn yě yǒu.*
I have iron bowl John also have
'I have one or more iron bowls. So does John.' or
'I have one or more steady jobs. So does John.'
(Cannot mean 'I have one or more steady jobs. John has one or more iron bowls.' or 'I have one or more iron bowls. John has one or more steady jobs.')

b. *Wǒ kànjiàn le mǔ lǎohǔ. Yuēhàn yě kànjiàn le.*
I see ASP female tiger John also see ASP
'I saw one or more tigresses. So did John.' or
'I saw one or more tigress-like women. So did John.'
(Cannot mean 'I saw one or more tigresses. John saw one or more tigress-like women.' or 'I saw one or more tigress-like women. John saw one or more tigresses.')

This construction can be used as a test for ambiguity in the same way as VP deletion in English. The nouns *tiě fànwǎn* in (11a) and *mǔ lǎohǔ* in (11b) are each ambiguous between a literal and a figurative interpretation. *Tiě fànwǎn* can mean either 'iron bowl' or 'steady job', and *mǔ lǎohǔ* is ambiguous between the senses 'female tiger' and 'tigress-like woman.' When the object is deleted under identity in the second conjunct, the deleted phrase needs to have the same sense as its antecedent. As a result, the two-sentence discourse as a whole is only two-ways ambiguous, not four-ways.

When we apply this test for ambiguity to bare nouns in Mandarin we find that it confirms the claim that they are unspecified for number, rather than ambiguous. (12) is true if the speaker and John each bought one book, or if they each bought more than one book, but it is also true in situations in which the speaker bought one book and John bought more than one, or vice versa:

(12) *Zuótiān wǒ mǎi le shū. Yuēhàn yě mǎi le.*
yesterday I buy ASP book John also buy ASP
'Yesterday I bought one or more books. So did John.'

3 General number: A typological perspective

3.1 Number neutral nouns across languages

In English, nouns are obligatorily specified for number; that is, every occurrence of a noun is either singular or plural.[4] In many of the world's languages, however, a noun can be unspecified for

[4]A possible exception to this are nouns that are the non-head member of a compound such as *stamp collection*.

number, i.e. have general number (see Krifka 1995, 2003; Gil 1996; Chierchia 1998a,b; Schmitt & Munn 1999; Carson 2000; Corbett 2000; Dayal 2002; Farkas & de Swart 2003, among others). In (13)–(16), examples are given from languages as diverse as Mandarin Chinese, Korean, Hungarian, and Turkish:

(13) *Zuótiān wǒ mǎi le shū.* (Mandarin Chinese)
yesterday I buy ASP book
'Yesterday, I bought one or more books.'

(14) *sakwa-ka chayksang wui-ey issta* (Korean; Kang 1994:6)
apple-NOM desk top-at exist
'There is/are apple(s) on the desk.'

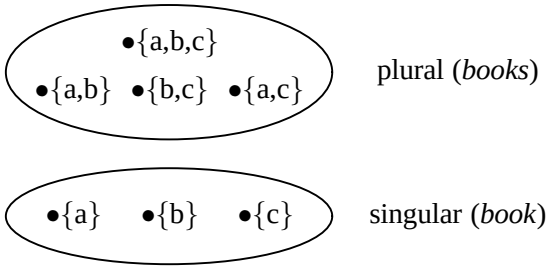
(15) *Mari verset olvas.* (Hungarian; Farkas & de Swart 2003:12)
Mari poem-ACC read
'Mari is reading a poem/poems.'

(16) *Kitap al-dı-m* (Turkish; Bliss 2003)
book buy-PAST-1S
'I bought a book/books.'

The difference between languages like English in which nouns are always specified for number and languages in which nouns may have general number can be captured quite straightforwardly in formal semantic terms. We assume a model in which the domain of entities of type *e* constitutes a complete free atomic join semi-lattice containing both singular entities (atoms) and their sums (pluralities) (Link 1983). For convenience, we will model atoms as singleton sets and pluralities as non-singleton sets. The part-of relation of the semi-lattice is then the subset relation $\subseteq$, and the join operation is set-theoretic union $\cup$.

In English-type languages, a singular count noun (which typically is morphologically unmarked) denotes a set of atoms, whereas the corresponding plural noun (usually formed by the addition of a plural affix) is usually assumed to denote the set of all pluralities that can be built out of the atoms:[5]

(17) Denotation of a singular and plural nouns in English



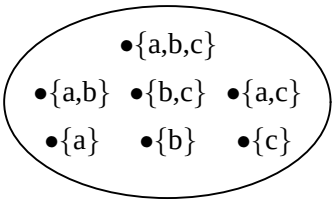
[5]Many researchers (e.g. Schwarzschild 1996; Krifka 2003; Rullmann 2003) have argued that the denotation of the plural noun should also include the atoms (i.e., PL(N) = *N), which would in effect mean that plural nouns in English have general number. We will leave further exploration of this interesting issue for another occasion.

We will assume the following semantics for the plural morpheme:[6]

(18) PL(N) = *N − At
where *N is the closure under union of N and At is the set of atoms.

In languages with general number, on the other hand, the base form of a count noun denotes a set containing both atomic entities and pluralities. In other words, the denotation of the base form of the noun is a complete semi-lattice generated by a set of atoms:

(19) Denotation of a noun with general number (e.g. Mandarin Chinese)



general (*shū*)

Note that the denotation of a noun with general number is closed under union (or "cumulative" in the sense of Krifka 1989, 1992), just like the denotation of a plural noun in English. As Chierchia (1998a,b) puts it, nouns in Chinese have their "plurality built in", a property they share with mass nouns in English, such as *water* and *furniture*. According to Chierchia, this means that in Chinese and other classifier languages all nouns are mass nouns. In this paper, we will ignore the contentious issue of what the exact nature of the mass/count distinction is, which raises many difficult ontological problems that we do not want to address in this paper. For this reason, instead of saying that the bare nouns in sentences like (13)–(16) are mass nouns, we will say that they have general number.[7]

3.2 General number and plural marking

The phenomenon of general number cannot simply be equated with total absence of number or number marking from a language. Several of the languages mentioned above actually do have plural morphemes (*pace* Chierchia 1998a,b; see Kang 1994; Schmitt & Munn 1999; Carson 2000; Corbett 2000; Farkas & de Swart 2003):

(20) *sakwa-tul-i* *chayksang* *wui-ey* *issta* (Korean: Kang 1994:6)
apple-PL-NOM desk top-at exist
'There are apples on the desk.'

[6]This definition differs from Chierchia (1998a) who defines PL(N) as *N − N. As will become clear below, Chierchia's definition gives the wrong result for languages in which nouns have general number but which do have a plural marker. Although Chierchia conjectures that such languages do not exist, they in fact do.

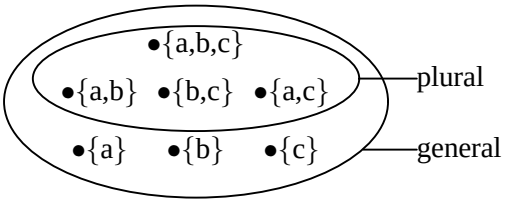
[7]It should be noted that according to Chierchia (1998a,b) – following Krifka (1995) – nouns in Mandarin and other classifier languages denote kinds. However, this is not such a big difference as it might appear, given the availability of the type shifter $\cup$ which maps a kind onto the set of the (atomic and non-atomic) entities that realize it. $\cup$ is defined in such a way that it always yields a set that is closed under union, i.e. after application of $\cup$ the noun has general number (or is "mass" in Chierchia's terms). Conversely, the denotation of Mandarin nouns depicted in (19) can be mapped onto the corresponding kind by Chierchia's other type shift $\cap$. So our approach differs from Chierchia's in which of the two possible denotations of bare nouns (kind or set of entities) is taken to be basic and which derived, but agrees with him in assuming that bare nouns have general number. See section 3.4 for a discussion of more important differences between Chierchia's approach and ours.

(21) *Mari verseket olvas.* (Hungarian; Farkas & de Swart 2003:12)
Mari poem-PL-ACC read
'Mari is reading poems.'

(22) *Kitap-lar al-dı-m* (Turkish; Bliss 2003)
book-PL buy-PAST-1SG
'I bought books.'

Here the plural form of the noun has a denotation that is a subset of the denotation of the noun itself, namely the subset containing all non-atomic members of the denotation of the noun (cf. Kang 1994; Carson 2000).

(23) Denotation of unmarked and plural noun in languages with general number (e.g. Korean, Hungarian, Turkish)



Note that the semantics of the plural as defined in (14) above will work for languages in which the noun has general number as well. Since for any noun denotation N in these languages, *N = N (i.e., the noun denotation is closed under union), PL(N) = *N − At = N − At.[8]

In a language which has general number as well as a plural marker, a situation involving more than one entity may in principle be described using either a plural noun or a noun with general number. This means that plural marking is in effect optional or "facultative" (Corbett 2000).

Mandarin Chinese does not have the kind of plural marker exemplified in (20)–(22), but that does not mean that it does not have any number morphology. First of all, number is expressed transparently in the pronominal system, as shown in the following paradigm:

(24)

	Singular	Plural
1st person	*wǒ*	*wǒ-men*
2nd person	*nǐ*	*nǐ-men*
3rd person	*tā*	*tā-men*

The same suffix *-men* that marks plurality in pronouns can also be used with human common nouns to form a definite plural NP:

(25) *Wǒ qù zhǎo háizi-men.* (Li 1999:78)
I go find child-PL
'I will go find the children.'

[8]Chierchia's definition of PL(N) as *N − N would result in the denotation of the plural noun being empty. On the basis of this he predicts that languages in which all nouns have general number (or are mass nouns, in his terminology) cannot have a plural marker, but as the examples of Turkish, Korean, Malay and Brazilian Portuguese show, this prediction is incorrect.

The status of *men* as a plural marker is somewhat controversial (see for instance Iljic 1994, 2001; Li 1999), and because Mandarin plurals with *men* are necessarily definite, it has a different status from the plural morphemes in Turkish, Hungarian, and Korean as well as from the English plural suffix *-s*. Nevertheless, Mandarin is clearly not a language "without number", nor is it a language that lacks number morphology. And as we will argue extensively below, even Mandarin DPs without overt number morphology may be semantically singular or plural.

3.3 Numerals and numeral classifiers

The phenomenon of general number not only manifests itself in bare nouns, but also in the fact that unmarked nouns can be used in combination with determiners that are semantically plural, in particular numerals greater than 'one' (cf. Ortmann 2000):

(26) *sakwa twu kay* (Korean; Kang 1994:2)
apple two CL
'two apples'

(27) *öt hajó* (Hungarian; Ortmann 2000:252)
five ship
'five ships'

(28) *kırk harami* (Turkish; Underhill 1979:125)
forty thief
'forty thieves'

We take this as additional evidence that in these languages the noun is number neutral, and hence compatible with determiners that are inherently plural.

Note that many of the languages with general number require the use of a classifier when the noun is modified by a numeral. However, this is not the case for all languages with general number. Mandarin and Korean require numeral classifiers, but Turkish, Hungarian and Brazilian Portuguese do not. We hypothesize that having general number is a necessary but not a sufficient condition for having numeral classifiers; that is, languages with numeral classifiers form a proper subset of the class of languages in which nouns have general number.

The idea that in languages with numeral classifiers the (unmarked) noun has general number is supported by Sanches (1973) who suggests the following implicational universal:

(29) If a language includes numeral classifiers as its dominant mode of forming quantification expressions, then it will also have facultative expression of plural. In other words, it will not have obligatory marking of the plural on nouns. (Sanches 1973:4)

Recall from what we said above that "facultative" number marking simply means that a noun without a plural marker denotes not just a set of atoms but the whole semi-lattice generated by the atoms, including the pluralities (see the picture in (23)); in other words, the unmarked noun has general number. Sanches's universal explicitly leaves open the possibility for a classifier language to have an optional plural marker; thus, it directly contradicts Chierchia's (1998a,b) prediction that in classifier languages nouns can never be pluralized. Counterexamples to Chierchia's generalization are languages with numeral classifiers which also have a plural marker, such as Korean and Malay/Indonesian (Kang 1994; Chung 2000; Carson 2000).

3.4 What is the relevant parameter?

The typology proposed in Chierchia (1998a,b) is based on a binary semantic parameter which distinguishes between languages in which all nouns are kind-referring and therefore can appear as bare arguments (such as Chinese) on the one hand, and languages in which count nouns don't refer to kinds and therefore cannot be used as bare arguments (such as English) on the other hand. The former type of language is predicted – largely on theorical grounds – to have the following characteristics (among others): (i) all nouns have general number (or in Chierchia's terms, they are "mass" nouns); (ii) obligatory use of numeral classifiers; (iii) absence of plural marking. Languages like English on the other hand lack all three characteristics. However, as we have just seen and has been pointed out in the literature (e.g., Schmitt & Munn 1999; Chung 2000; Carson 2000) this dichotomy is too rigid empirically. For instance, bare nouns with general number occur in languages that do not have (obligatory) numeral classifiers such as Brazilian Portuguese and Hungarian. Moreover, several languages with numeral classifiers have (optional) plural markers, including Korean, Malay/Indonesian, and perhaps even Mandarin, if we regard *-men* as a plural marker. Finally, not all languages which allow bare nouns can use them for reference to kinds. In Hungarian, for instance, bare nouns cannot be used in generic (kind-referring) statements (Farkas & de Swart 2003).

As an alternative to Chierchia's parameter, we would like to suggest that the main typological distinction is not that between classifier and non-classifier languages, but between languages in which morphologically unmarked nouns have general number and languages in which unmarked (count) nouns are semantically singular. Classifier languages make up only a proper subset of the former type. Plural markers can in principle appear in either type of language, but in a language in which the unmarked noun has general number (i.e., includes the pluralities in its denotation) plural marking will be optional, because to pick out a plurality the speaker can use either a plural or an unmarked noun.

According to Chierchia, in languages like Chinese, nouns can be used as arguments because they denote kinds, whereas in languages like English count nouns denote sets of atomic entities. If our alternative line of thinking is correct, the crucial parameter does not involve kind reference, but number: in some languages the extension of morphologically unmarked count nouns includes only atoms, whereas in other languages it includes both atoms and pluralities. In the former type of languages unmarked count nouns are semantically singular, whereas in the latter type they have general number.

4 Truth conditions

Given that bare nouns in Mandarin have general number, an important question arises. Consider again (1), repeated here as (30), which contains a bare noun with an indefinite interpretation, and compare it to the corresponding sentence with a singular indefinite full DP or its English counterpart with the determiner *a(n)*:

(30) *Zuótiān wǒ mǎi le shū.*
yesterday I buy ASP book
'Yesterday, I bought one or more books.'

(31) *Zuótiān wǒ mǎi le (yī) běn shū.*
yesterday I buy ASP one CL book
'Yesterday, I bought a book.'

(32) Yesterday I bought a book.

In the Gricean tradition it is generally assumed that (31) and (32) are actually true if the speaker bought more than one book. The fact that, without further information, the hearer is entitled to conclude from (31)/(32) that the speaker did not buy more than one book is regarded as a conversational implicature rather than an entailment of the sentence. But if (31)/(32) is true iff the speaker bought one or more books, then what exactly is the difference between (31)/(32) in which the noun is singular and (30) in which the noun has general number? We will adopt the position that (30) and (31)/(32) indeed do have the same truth conditions. Of course, this does not mean that bare nouns and indefinite full DPs have the same meaning. There are important semantic and pragmatic differences between the two. The remainder of this paper discusses three such differences, namely scope (section 5), discourse anaphora (section 6), and scalar implicatures (section 7).

5 Scope

5.1 Bare nouns (appear to) take narrow scope

Chinese bare nouns behave in essentially the same way as English bare plurals with respect to scope. Carlson (1977) has demonstrated with an extensive battery of tests that English bare plurals always seem to take the narrowest possible scope, unlike singular or plural indefinites with a determiner (e.g., *a book* and *some books*) which may take either wide or narrow scope. (See also Chierchia 1998b for a recent summary and update of Carlson's analysis of bare plurals.) As Yang (2001) has shown, Carlson's observations carry over to Mandarin Chinese. We will just discuss a small but representative subset of the relevant data.

The scopal contrast between bare nouns and indefinite DPs is manifested in intensional contexts:

(33) a. Minnie wishes to talk with a young psychiatrist. (wide or narrow scope)

b. Minnie wishes to talk with young psychiatrists. (only narrow scope)

(34) a. *Tā xiǎng gēn yīgè niánqīng de xīnlǐxuéjiā tántan.* (wide or narrow)
she wish with one-CL young MOD psychiatrist talk
'She wishes to talk with a young psychiatrist.'

b. *Tā xiǎng gēn niánqīng de xīnlǐxuéjiā tántan.*
she wish with young MOD psychiatrist talk
i. 'She wishes to talk with young psychiatrists.' (narrow scope)
ii. 'She wishes to talk with the young psychiatrist(s).' (definite reading)

In (33a), the singular indefinite *a young psychiatrist* can take either wide or narrow scope with respect to the intensional verb *wishes*, whereas in (33b) the bare plural *young psychiatrists* can only take narrow scope. This is also true for their Mandarin Chinese equivalents in (34a,b). Note

however that the Chinese bare noun also has the option of taking a definite reading which should not be confused with a wide-scope indefinite interpretation.

That bare plurals do not take wide scope is also true in the presence of a universal quantifier:

(35) a. Everyone read a book on caterpillars. (wide or narrow)

b. Everyone read books on caterpillars. (only narrow scope)

(36) a. *Měigè rén dōu dú guò yìběn guānyú yòuchóng de shū.*
every-CL person all read ASP one-CL on caterpillar MOD book
'Everyone read a book on caterpillars.' (wide or narrow)

b. *Měigè rén dōu dú guò guānyú yòuchóng de shū.*
every-CL person all read ASP on caterpillar MOD book
'Everyone read books on caterpillars.' (narrow scope)

In (35a), the indefinite singular *a book on caterpillars* can take either wide or narrow scope with respect to the universal quantifier *everyone*. In contrast, the bare plural *books on caterpillars* in (35b) can only take narrow scope. This observation also carries over to Mandarin Chinese.

Indefinite singulars and bare plurals also exhibit what Carlson (1977) calls "differentiated scope": the fact that a bare plural can sometimes even have narrower scope than an indefinite singular possibly could:

(37) a. #A dog was everywhere.

b. Dogs were everywhere.

(38) a. *#Yìzhī gǒu suíchù kě jiàn.*
one-CL dog everywhere can see
'A dog can be seen everywhere.'

b. *Gǒu suíchù kě jiàn.*
dog everywhere can see
'Dogs can be seen everywhere.'

In (37a), the indefinite singular *a dog* can only have a wide scope reading, in which the same dog is visible everywhere. In (37b), however, the bare plural *dogs* can only take narrow scope, with the universal quantifier *everywhere* having wide scope. As (38) shows, this differentiated scope phenomenon can also be observed in the behaviour of Mandarin indefinite singulars and bare nouns.

5.2 Two approaches to obligatory narrow scope of bare nouns

In the literature there are two approaches for explaining the obligatory narrowest scope behavior of bare nouns. On the one hand there is the Carlsonian analysis according to which bare nouns refer to kinds (Carlson 1977; Krifka 1995; Chierchia 1998a,b; Dayal 1999, 2002, among others). In this approach bare nouns are names for kinds, and therefore they are scopeless just like proper names for concrete individuals. The existential force of sentences like (1), repeated here as (39), is due not to the bare noun itself but to the environment in which it appears. In Carlson's own analysis, the existential quantification is built into the lexical meaning of the verb. Chierchia

(1998b) has proposed an alternative version of the same approach, in which the kind-denoting term combines with a verb through a special semantic rule, which he dubs Derived Kind Predication (DKP), given in (40). (41) illustrates the application of this rule in a case like (39). Here $^\cap$ is an operator mapping a noun denotation onto the corresponding kind, whereas $^\cup$ conversely maps a kind onto the set of its realizations (for details see Chierchia 1998b). Note that DKP will have to be suitably restricted to apply only "locally" in order to account for the obligatory narrowest scope for bare nouns (cf. Krifka 2003):[9]

(39) *Zuótiān wǒ mǎi le shū.*
yesterday I buy ASP book
'Yesterday, I bought one or more books.'

(40) Derived Kind Predication (DKP) (Chierchia 1998b)
If P applies to objects and k denotes a kind, then $P(k) = \exists x[^\cup k(x) \wedge P(x)]$

(41) buy(I, $^\cap$ book)
$\Leftrightarrow \exists x[^\cup{}^\cap\text{book}(x) \wedge \text{buy}(\text{I}, x)]$ (by DKP)
$\Leftrightarrow \exists x[\text{book}(x) \wedge \text{buy}(\text{I}, x)]$

The alternative approach is to treat bare nouns as properties (see, among many others, Dobrovie-Sorin 1997; van Geenhoven 1998, 1999; van Geenhoven & McNally 2002; Chung & Ladusaw 2003, and Farkas & de Swart 2003). There are different versions of this approach as well. We will here briefly sketch Chung and Ladusaw's recent account (Chung & Ladusaw 2003). According to them there are two "modes of composition" for a predicate and its syntactic argument: saturation and restriction. An argument which saturates the predicate reduces its arity by one, in the familiar way. For a syntactic argument to restrict the predicate, on the other hand, means that the argument slot of the predicate is not filled, but that a restriction is added to it. Using this framework, we hypothesize that indefinite bare nouns in Mandarin combine with the verb through restriction rather than saturation. That is, in (39) *shū* 'book' functions as a property which restricts the object argument variable of the verb to books, as in (42). Subsequently, the operation of Existential Closure (EC) applies at the VP level binding the object variable, as in (43).

(42) $\text{Restrict}(\lambda y \lambda x[\text{buy}(y)(x)], \text{book})$
$\Leftrightarrow \lambda y \lambda x[\text{buy}(y)(x) \wedge \text{book}(y)]$

(43) $\text{EC}(\lambda y \lambda x[\text{buy}(y)(x) \wedge \text{book}(y)])$
$\Leftrightarrow \lambda x \lambda y[\text{buy}(y)(x) \wedge \text{book}(y)]$

Alternatively, we could achieve the existential reading of the bare noun by means of a type-shift that applies to the verb (van Geenhoven's semantic incorporation).

In either approach, bare nouns are not quantifiers, and the existential interpretation is due to something else external to the bare noun. Because bare nouns are not quantifiers they cannot take wide scope. Indefinite full DPs, on the other hand, are existential quantifiers and as such they can take wide scope through Quantifier Raising (or any other device responsible for "wide scope" readings of indefinites, such as choice functions).

[9] One could argue that the need for such a locality constraint on DKP means that in Chierchia's analysis (in contrast to Carlson) the obligatory narrow scope of bare nouns is essentially stipulated.

One apparent advantage of the kind-based approach is that it allows for a unified treatment of existential and generic interpretations of bare nouns. However, once we allow type-shifting between kinds and properties with operators such as $\cup$ and $\cap$ the way Chierchia does, the difference between the two approaches becomes much less pronounced (see Krifka 2003). For instance, a hybrid account is possible in which the basic denotation of a bare noun is a property which can combine with the verb through Chung and Ladusaw's Restrict operation to get an indefinite interpretation, but can shift to kind with $\cap$ to derive a kind-denoting interpretation in generic sentences.

6 Discourse anaphora

Another way in which indefinite bare nouns in Mandarin differ from singular indefinite full DPs is in their potential for discourse anaphora. In English, a singular indefinite can only be referred back to by a singular pronoun, whereas a plural indefinite requires a plural pronoun:

(44) a. Yesterday I bought a book. I brought it/*them home with me.

b. Yesterday I bought (some) books. I brought them/*it home with me.

We can use the potential for allowing singular or plural discourse anaphora as a probe for the semantic number of bare nouns and indefinite full DPs.

In Mandarin, bare nouns can be the antecedent for either a singular or a plural overt pronoun as in (45a,b), or for a null pronoun which itself is unspecified for number, as in (45c). (The overt pronoun in (45b) is a bit less natural than the null pronoun in (45c); the choice between an overt or null pronoun is governed by factors such as animacy which need not concern us here.)

(45) a. *Zuótiān wǒ yùdào le tóngshì. Wǒ qǐng tā/tāmen chīfàn le.*
yesterday I meet ASP colleague I invite {him,her}/them eat ASP
'Yesterday, I met one or more colleagues. I invited him/her/them to dinner.'

b. *Zuótiān wǒ mǎi le shū. Wǒ bǎ tā/tāmen dài huí jiā le.*
yesterday I buy ASP book I BA it/them bring back home ASP
'Yesterday, I bought one or more books. I brought it/them home.'

c. *Zuótiān wǒ mǎi le shū. Wǒ dài ∅ huí jiā le.*
yesterday I buy ASP book I bring back home ASP
'Yesterday, I bought one or more books. I brought it/them home.'

This contrasts with indefinite full DPs which are either singular or plural. In Mandarin, singular indefinite DPs of the form '(*yī*) CL N' can only antecede the singular pronoun *ta* 'him/her' or a null pronoun. DPs of the form '*yixie* N' are semantically plural and require the plural *tamen* 'they' or a zero pronoun:

(46) a. *Zuótiān wǒ yùdào le (yī) ge tóngshì. Wǒ qǐng tā/*tāmen*
yesterday I meet ASP one CL colleague I invite {him,her}/*them
chīfàn le.
eat ASP
'Yesterday, I met one colleague. I invited him/her to dinner.'

b. *Zuótiān wǒ mǎi le* (*yì*) *běn shū. Wǒ bǎ tā/*tāmen dài huí jiā le.*
yesterday I buy ASP one CL book I BA it/*them bring back home ASP
'Yesterday, I bought one book. I brought it home.'

c. *Zuótiān wǒ mǎi le* (*yì*) *běn shū. Wǒ dài* ∅ *huí jiā le.*
yesterday I buy ASP one CL book I bring back home ASP
'Yesterday, I bought one book. I brought it home.'

(47) a. *Zuótiān wǒ yùdào le yìxiē tóngshì. Wǒ qǐng *tā/tāmen chīfàn le.*
yesterday I meet ASP some colleague I invite {*him,*her}/them eat ASP
'Yesterday, I met some colleagues. I invited them to dinner.'

b. *Zuótiān wǒ mǎi le yìxiē shū. Wǒ bǎ *tā/tāmen dài huí jiā le.*
yesterday I buy ASP some book I BA *it/them bring back home ASP
'Yesterday, I bought some books. I brought them home.'

c. *Zuótiān wǒ mǎi le yìxiē shū. Wǒ dài* ∅ *huí jiā le.*
yesterday I buy ASP some book I bring back home ASP
'Yesterday, I bought some books. I brought them home.'

We see that although sentences containing an indefinite with general number may have the same truth conditions (or "static" semantics in the sense of Groenendijk & Stokhof 1990) as their counterparts with a singular indefinite, they differ in the effect they have on the discourse context (i.e., their "dynamic" semantics). This effect can be described in terms of the kind of discourse referent that is introduced by the indefinite. Whereas singular indefinites introduce a singular discourse referent and plural indefinites introduce a plural discourse referent, indefinites that have general number introduce a discourse referent that is itself unspecified for number, and which therefore can be "picked up" by a singular pronoun, a plural pronoun, or by a pronoun with general number.

Finally, it should be noted that there is significant crosslinguistic variation with respect to the "discourse transparency" of bare nouns (see van Geenhoven 1998; Dayal 1999; Farkas & de Swart 2003), another issue which deserves further exploration.

7 Scalar implicatures

7.1 Horn Scales and diagnostics

A third non-truth-conditional difference between indefinite bare nouns and singular indefinites is in the kinds of conversational implicature they can give rise to. As noted above, singular indefinites such as *a book* are truth-conditionally equivalent to *at least one book*; the upper-bounding inference *not more than one book* that can (normally) be made when the sentence is uttered is a conversational implicature which arguably follows from Grice's Maxim of Quantity (Grice 1967). This upper-bounding implicature can be cancelled, unlike entailments:

(48) a. John bought a book. In fact, he bought five books.

b. #John bought five books. In fact, he didn't buy a book. (contradiction)

Grice's seminal insights about quantity-based implicatures were worked out in more detail by (Horn 1972, 1989, 1992). Scalar expressions can be arranged from left to right on a Horn scale in order of decreasing informativeness or semantic strength:

(49) <*all, some*>
<*and, or*>
<*sweltering, hot, warm*>
<*love, like*>
<*n, . . . 5, 4, 3, 2, 1*>

On a Horn scale, an item on the left (i.e., a stronger expression) entails any item(s) to its right (i.e., weaker expressions), but not vice versa. Therefore, the (a) sentences in (50)–(51) entail the (b) sentences.

(50) a. The room is sweltering.

b. The room is hot.

(51) a. All the boys went to the party.

b. Some of the boys went to the party.

On the other hand, assertion that a weaker expression on a Horn scale obtains implicates that stronger ones do not. Therefore, the (a) sentences in (52)–(53) implicate the (b) sentences.

(52) a. The room is hot.

b. The room is not sweltering.

(53) a. Some of the boys went to the party.

b. Not all of the boys went to the party.

One of Horn's main diagnostics for the presence of scalar implicatures involves the English expression *in fact*, which can be used to signal implicature cancellation:

(54) a. She is pretty. In fact she is beautiful.

b. #She is beautiful. In fact she is pretty.

c. #She is pretty. In fact she is ugly.

In (54a), the second clause is a denial of the scalar implicature generated by the first clause, as signalled by the presence of *in fact*. In (54b), the second clause is an entailment of the first clause, and therefore *in fact* is out of place. In (54c), the second clause is a contradiction of the first clause,and cancellation is impossible. Mandarin Chinese has an expression *shìshíshàng* which behaves just like *in fact*, and which therefore can similarly be used as a diagnostic:

(55) a. *Tā hěn hǎokàn. Shìshíshàng tā hěn piàoliàng.*
she very pretty in fact she very beautiful
'She is very pretty. In fact she is very beautiful.'

b. *#Tā hěn piàoliàng. Shìshíshàng tā hěn hǎokàn.*
she very beautiful in fact she very pretty
'She is very beautiful. In fact she is very pretty.'

c. *#Tā hěn hǎokàn. Shìshíshàng tā hěn chǒu.*
she very pretty in fact she very ugly
'She is very pretty. In fact she is very ugly.'

Another well-known diagnostic for scalar implicatures due to Horn is the use of *if not*. A construction of the form *X if not Y* (where *X* and *Y* are part of a Horn scale, and *Y* is stronger than *X*) serves to assert *X* while suspending the scalar implicature that *Y* does not obtain. As the following examples show, *X if not Y* is indeed only wellformed if *Y* is a stronger expression than *X* on a Horn scale.

(56) a. He is a millionaire if not a billionaire.

b. #He is a billionaire if not a millionaire.

c. #He is a millionaire if not a pauper.

Mandarin has a construction similar to English *if not*, which functions just like its English counterpart:

(57) a. *Tā bú shì yìwànfùwēng yě shì bǎiwànfùwēng.*
he not be billionaire at least be millionaire
'He is a millionaire if not a billionaire.'

b. *#Tā bú shì bǎiwànfùwēng yě shì yìwànfùwēng.*
he not be millionaire at least be billionaire
'He is a billionaire if not a millionaire.'

c. *#Tā bú shì yìwànfùwēng yě shì qǐgài.*
he not be billionaire at least be pauper
'He is a pauper if not a billionaire.'

7.2 Applying the diagnostics to Mandarin bare nouns and full DPs

Just as in English, singular indefinites in Mandarin trigger the scalar implicature that not more than one entity is involved. However, this scalar implicature is absent with bare nouns. This is shown by the fact that while singular indefinites are compatible with an expression marking the cancellation of a scalar implicature such as *shìshíshàng* 'in fact', bare nouns are not:

(58) a. *Zuótiān wǒ mǎi le yì běn shū. Shìshíshàng, wǒ mǎi le wǔ běn.*
yesterday I buy ASP one CL book in fact I buy ASP five CL
'Yesterday I bought a book. In fact, I bought five.'

b. *#Zuótiān wǒ mǎi le shū. Shìshíshàng, wǒ mǎi le wǔ běn.*
yesterday I buy ASP book in fact I buy ASP five CL
'Yesterday I bought one or more books. In fact, I bought five.'

Note in passing that the version of (58a) without *yī* is somewhat less good than that the one with *yī*. We attribute this difference to a need to signal the contrast between 'one' in the first clause and 'five' in the second.

It is interesting to observe that Mandarin has another expression *zhǔnquè de shuō* 'to be exact', which can be used to further specify the number of entities involved, but does not cancel the scalar implicature. This expression shows the opposite pattern from *shìshíshàng* 'in fact': it is fine with bare nouns but is much less felicitous with singular or plural indefinites:

(59) a. *#Zuótiān wǒ mǎi le yì běn shū. Zhǔnquè de shuō, wǒ mǎi le wǔ běn.*
yesterday I buy ASP one CL book exactly MOD say I buy ASP five CL
'Yesterday, I bought a book. To be exact, I bought five.'

b. *Zuótiān wǒ mǎi le shū. Zhǔnquè de shuō, wǒ mǎi le wǔ běn.*
yesterday I buy ASP book exactly MOD say I buy ASP five CL
'Yesterday, I bought one or more books. To be exact, I bought five.'

The *if not* diagnostic similarly demonstrates that unlike singular full DPs, bare nouns in Mandarin do not trigger the upper-bounding scalar implicature 'not more than one':

(60) a. *Tā rúguǒ méi yǒu liǎnggè háizi yě yǒu yígè.*
he if not have two-CL child at least have one-CL
'He has one child, if not two.'

b. *#Tā rúguǒ méi yǒu liǎngge háizi yě yǒu háizi.*
he if not have two-CL child at least have child
'He has a child/children, if not two.'

Of course we are not claiming that Mandarin bare nouns lack scalar implicatures altogether. Although they do not trigger scalar implicatures related to number, they may have other scalar implicatures if the noun itself can plausibly be regarded as a scalar expression:

(61) a. *Tā mǎi le shū. Shìshíshàng tā mǎi le bǎikēquánshū.*
he buy ASP book in fact he buy ASP encyclopedia
'He bought one or more books. In fact he bought one or more encyclopedias.'

b. *Tā rúguǒ bú shì báichī yě shì shǎguā.*
he if not be idiot at least be fool
'He was a fool if not an idiot.'

7.3 Metalinguistic negation

Further evidence comes from the phenomenon of metalinguistic negation (Horn 1989; see also Geurts 1998 for a somewhat different perspective). Metalinguistic negation is the use of negation to signal a rejection of the corresponding positive sentence for any reason other than its truth conditions. Possible reasons include the sentence's pronunciation, its register, its presupposition, and – most relevant for our purposes – its conversational implicatures, as demonstrated in (62). Metalinguistic negation can also be observed in Mandarin, as shown in (63):

(62) a. I don't LIKE him – I LOVE him.

b. She is not PRETTY – She is BEAUTIFUL.

(63) a. *Wǒ bù zhǐshì xǐhuān tā, ěrshì ài tā.*
I not just like him, but love him
'I don't just like him – I love him.'

b. *Tā bù zhǐshì hǎokàn, ěrshì piàoliàng.*
she not just pretty but beautiful
'She is not pretty – she is beautiful.'

(64) demonstrates that in Mandarin metalinguistic negation of the scalar implicature 'not more than one' is possible with singular indefinites but not with bare nouns.[10] This is additional evidence that bare nouns do not trigger the scalar implicature 'not more than one'. (65) shows that in this respect English bare plurals behave the same way as bare nouns in Mandarin:

(64) a. *Wǒ bù zhǐ shì mǎi le yì běn shū, ěrshì mǎi le wǔ běn.*
I not just be buy ASP one CL book but buy ASP five CL
'I didn't buy one book. I bought five.'

b. *#Wǒ bù zhǐ shì mǎi le shū, ěrshì mǎi le wǔ běn.*
I not just be buy ASP book but buy ASP five CL
'I didn't buy one or more books. I bought five.'

(65) a. I didn't buy ONE/A book – I bought FIVE.

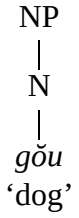
b. #I didn't buy books – I bought FIVE.

7.4 Discussion

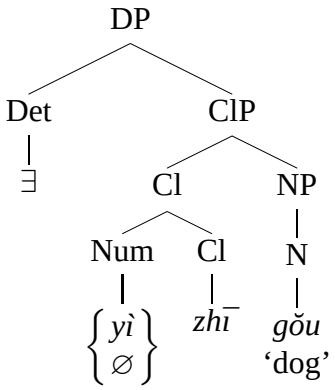
Why don't bare nouns trigger scalar implicatures about number, as opposed to indefinite full DPs? The reason is that for a scalar implicature to arise the utterance must contain a lexical item that is a member of a Horn scale which also contains stronger alternative expressions that the speaker could have used instead but didn't. But bare nouns are quite literally bare: they consist of just the head noun (plus possible modifiers) but do not contain any functional morphemes such

[10]Note that for reasons which we do not quite understand *zhǐ* 'just' cannot be omitted from these examples (our thanks to Marie-Claude Paris for pointing this out to us). This might mean that (64a,b) are not really cases of metalinguistic negation, but rather involve ordinary negation of 'just'. However, because 'just' itself is scalar, the contrast between (64a) and (b) still supports our claim that bare nouns do not evoke numerical scales in contrast to full indefinite DPs.

as classifiers, numerals, or determiners. Bare nouns, we assume, are simply NPs, that is, phrasal projections of the head noun N, without any functional projections "on top":[11]

(66)


Indefinite full DPs, however, do have functional structure above NP. In the syntactic literature there is considerable disagreement about the internal syntactic structure of Chinese DPs, with almost every author proposing a different structure (Tang 1990; Krifka 1995; Yang 2001; Li 1999; Cheng & Sybesma 1999, among others). Fortunately, for our purposes these details are not very important, as long as full DPs have functional projections whereas bare nouns don't. For the sake of concreteness let's assume that indefinite full DPs contain at least two layers on top of NP: ClP, headed by the classifier Cl, and DP (Tang 1990):[12]

(67)


As far as the semantics is concerned, we will follow Krifka (1995) in assuming that the classifier "measures" the number of atoms in a plurality (and adds sortal restriction, which we will ignore here). The existential quantification we assume – again somewhat arbitrarily – is performed by the (empty) indefinite determiner (or, alternatively, by a type shifting operation; Chierchia 1998a,b; Krifka 2003). Keeping things simple, and not worrying about questions of compositionality, the meaning of the DP *(yì) zhī gǒu* 'one/a dog' is as represented in (68):

(68) $\lambda P \exists x[\text{dog}(x) \wedge \text{card}(x) = 1 \wedge P(x)]$

The scalar implicature triggered by indefinite full DPs crucially depends on the presence of a numeral. Numerals form a Horn scale <*n*, …, *five*, *four*, *three*, *two*, *one*>, or in Mandarin <*n*, …, *wǔ*, *sì*, *sān*, *èr/liǎng*, *yī*>. The scalar implicature arises because the speaker chooses

[11]Here we adopt the DP hypothesis of Abney (1987) and much subsequent work, according to which what is traditionally called a noun phrase is really the maximal projection DP of the determiner D, whereas NP is the maximal projection of N without any functional items (corresponding to N' in earlier generative theorizing).

[12]In this structure the classifier is assumed to form a constituent with the numeral, reflecting the considerable evidence that in Mandarin and crosslinguistically numeral-classifiers are closely associated with each other and form a syntactic unit (Greenberg 1975; Krifka 1995). An alternative would be to treat the numeral as a head which projects its own functional projection (cf. Cheng & Sybesma 1999).

a particular item on this scale, say *yī* 'one', as opposed to any of the stronger lexical items (i.e., higher numerals) that she could have chosen (see Horn 1992 for a defense of the neo-Gricean approach to scalar implicatures involving numerals). With bare nouns, by contrast, there is no numeral, and hence no Horn scale or scalar implicature either. Note that in this explanation it is crucial that in Horn's version of the Gricean framework scalar implicatures are triggered by specific lexical items in the sentence, rather than more indirectly by the sentence's truth conditions.

This account of the absence of numerical scalar implicatures with bare nouns has an interesting theoretical consequence regarding the status of null elements. Recall that in Mandarin the numeral *yī* 'one' can sometimes be omitted, resulting in noun phrases such as *zhī gǒu* 'CL dog'. Yang (2001) argues that this is due to a rather superficial deletion of the numeral under certain circumstances. Alternatively, one could assume that there is a phonologically empty numeral with the same meaning as *yī* 'one'. But as we saw above such singular indefinites without a numeral behave like indefinite full DPs with the numeral 'one' (e.g. *yī zhī gǒu*) and more specifically they trigger scalar implicatures, unlike bare nouns like *gǒu* 'dog'. We must therefore assume that even a "deleted" or "empty" numeral counts as a lexical item that is a member of a Horn scale and can therefore trigger a scalar implicature. Thus, there is a crucial difference between the complete absence of a numeral in bare nouns, and the presence of an empty or deleted numeral in full DPs such as *zhī gǒu*.

8 Summary and conclusion

In this paper we have contrasted bare nouns in Mandarin Chinese with indefinite full DPs. Bare nouns have general number (i.e., they are number neutral), whereas indefinite full DPs are either singular or plural. Nevertheless, simple sentence pairs such as *Zúotiān wǒ mǎi le shū* (lit. 'Yesterday, I bought book') and *Zúotiān wǒ mǎi le (yī) běn shū* ('Yesterday, I bought a book') are truth-conditionally equivalent. However, we have identified three important pragmatic and semantic differences between the two types of noun phrases, at least two of which are directly tied to the difference in number. One such difference is in the effect on discourse: Indefinite full DPs introduce singular or plural discourse referents, whereas bare nouns introduce discourse referents that are number neutral. A second difference has to do with implicatures: indefinite full DPs trigger scalar implicatures about number, but bare nouns don't. The third difference is in scope: whereas indefinite full DPs are existential quantifiers that can take wide or narrow scope, bare nouns do not have any quantificational force of their own, and therefore always seem to take narrowest scope (but strictly speaking they are scopeless), either because they refer to kinds or because they denote properties. To what extent – and how – this last property of bare nouns is inherently connected with the fact that they have general number is a question we will leave for future research.

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TOLERATING EXCEPTIONS WITH 'DESCRIPTIVE' AND 'IN VIRTUE OF' GENERICS: TWO TYPES OF MODALITY AND REDUCED VAGUENESS

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1 Introduction

Generic sentences have been known for a long time to pose many interesting and difficult puzzles for semantic theory, one of the hardest of which is their exceptions tolerance property. To illustrate this property consider, for example, generic sentences as in (1a), with indefinite singular subjects (labeled IS sentences), and those as in (1b), with bare plural subjects (labeled BP sentences):

(1) a. A dog has four legs. (**An IS sentence** – with an indefinite singular subject)
b. Dogs have four legs. (**A BP sentence** – with a bare plural subject)

Although both (1a) and (1b) are similar to sentences like *Every dog has four legs* in expressing generalizations over dogs, they easily tolerate the existence of dogs with less (or even more) than four legs, e.g. those which had some mutation, those who have undergone an accident, etc. That is, such dogs falsify neither (1a) nor (1b). The question is how to capture this exceptions tolerance property, and moreover, how to connect it to other well known properties of generics, like their law-like, 'nonaccidental' nature.

My goal in this paper is to develop a mechanism for tolerating exceptions for IS and BP generic sentences like (1a) and (1b), which is indeed systematically connected to the type of law-likeness they express. The theory I develop integrates insights from two main sources. The first is Kadmon and Landman's (1993) claim that the exceptions-tolerance property of generics is due to the fact that the generic operator, Gen, is a 'domain vague' quantifier, and their supervaluationist treatment of this type of vagueness. The second is Greenberg's 2003 claim that a number of traditionally reported differences between IS and BP sentences can be naturally explained if we assume that the two types of sentences can express different types of nonaccidentalness or law-likeness, and are formally associated with two different types of modality or accessibility relations.

The main observation I will make is that, in addition to the traditionally reported differences between IS and BP sentences, (starting from Lawler's 1973 classical contrast in felicity between sentences like *Madrigals are popular* and *#A madrigal is popular*), there is, in fact, an additional difference between the two types of sentences, so far unnoted, which concerns the way they tolerate exceptions. After showing how this newly observed difference can be captured by using a modified version of Kadmon and Landman's 'domain vague' restriction, I argue that it is systematically affected by the difference in the type of modality that IS and BP sentences are compatible with, argued for in Greenberg (2003).

The structure of this paper is as follows. Sections 1 and 2 give the background for my proposal, namely reviews of Greenberg's 2003 claims about the different accessibility relations associated with IS and BP sentences, and of Kadmon and Landman's supervaluationist treatment of the vagueness of Gen as explaining the tolerance of exceptions property. In section 3 I claim that Kadmon and Landman's original domain vague restriction is, in fact, too vague, and has to be modified. Specifically, I show how limiting the original domain vague restriction in two different ways leads to successfully capturing a newly observed difference in the way IS and BP sentences tolerate exceptions. Section 4 shows that the new difference in domain vagueness can be naturally explained if we assume that it is systematically affected by the difference in the type of modality (argued for in Greenberg 2003). I conclude the paper in section 5, where I also point out several potential directions for further research.

2 Greenberg (2003): Basic similarities and differences between IS and BP generics

2.1 Basic similarities, and the traditional uniform representation

Consider again minimal pairs of IS and BP generics, like (2)–(4):

(2) A dog has four legs / Dogs have four legs

(3) A grizzly bear snores loudly / Grizzly bears snore loudly

(4) A Volvo car is expensive / Volvo cars are expensive

At first glance such minimal pairs seem very similar, in fact almost synonymous. This is not a mere superficial impression. Indeed, there are several important semantic properties such pairs share. As has been claimed extensively in the genericity literature (see e.g. Krifka 1987; Krifka et al. 1995; Wilkinson 1991; Chierchia 1995, 1998) both types of sentences express generalizations over individuals and contextually relevant situations (e.g. about individual grizzly bears in sleeping situations)[1]. In addition, despite their apparent similarity to sentences with explicit universal statements (e.g. *Every grizzly bear snores loudly*), IS and BP sentences are different from them in several ways. First, both are *stronger* than explicitly universal sentences in that the generalizations they express are 'nonaccidental', or 'law-like'. Among other things, this is indicated by their counterfactual support property. Both sentences in (3), for example, support the counterfactual in (5):

(5) If this were a grizzly bear, it would snore loudly as well (pointing to a brown bear)

[1]Chierchia (1995) claims that we get generalizations over situations even when the predicate is individual level (as in *A dog has four legs / Dogs have four legs*). I will follow him on this point.

Second, both IS and BP sentences are also *weaker* than explicit universal statements, in that, as mentioned above, they allow for exceptions, i.e. they are not falsified by the existence of several grizzly bears who do not snore loudly (as well as by several sleeping situations in which grizzly bears do not snore loudly). A strong intuition of many theories of genericity (see e.g. Asher & Morreau 1995; Pelletier & Asher 1997; Condoravdi 1997; Eckardt 1999) is that the legitimate exceptions are considered 'abnormal' in some sense. In the case of the IS and BP sentences in (2), for example, it is dogs who have undergone a mutation, a car accident, or the like, which will be naturally considered legitimate exceptions.

Notice, finally, that both IS and BP sentences can express generalizations of different types, e.g. epistemic, deontic, linguistic generalizations, etc., as in (6), (7) and (8), respectively:

(6) Cats have four legs / A cat has four legs

(7) Gentlemen open the door for a lady / A Gentleman opens the door for a lady

(8) Bachelors are never married men / A bachelor is a never married man

These similarities between IS and BP generics suffice to clarify why it is that most theories of genericity (e.g. Chierchia 1995, 1998; Krifka et al. 1995; Krifka 1995; Wilkinson 1991; ter Meulen 1995; Link 1995; Schubert & Pelletier 1988) assigned such minimal pairs an equivalent, uniform semantic structure, as quantificational modalized generics known in the literature as I-generics (using Krifka's 1987 terminology). This uniform representation is usually some version or other of the Chierchian (1995; 1998) style structure in (9):

(9) $\forall w'[w'$ is appropriately accessible from $w] \rightarrow [\forall x, s[$grizzly bear$(x, w') \wedge C(s, x, w')] \rightarrow [$snore loudly$(s, x, w')]]$
(Paraphrase: 'In all worlds w' appropriately accessible from the world of evaluation, w, every grizzly bear, in every contextually relevant situation (e.g. every sleeping situation) is snoring very loudly'.)

(9) says that the truth of the universal statement is not accidental, i.e. not limited to the actual world, but is expected to hold in other relevant ('accessible') possible circumstances ('worlds') as well. The variability in the type of generalizations (epistemic, deontic, linguistic, etc.) is captured by letting the accessibility relation be context dependent, and vary, as in Kratzer's (1981) analysis of sentences with modal verbs (like 'John must be in his room'), which can be also e.g. epistemic and deontic.

As for the exceptions tolerance property, there have been several suggestions in the literature for dealing with this problem, some restricting the set of accessible worlds to the 'most normal' ones (e.g. Delgrande 1988; Krifka et al. 1995; Krifka 1995), some changing the quantificational force of Gen from universal (as is usually done) to something like most (like Farkas & Sugioka 1985 or Cohen 1999), still others positing a 'normal' modifier on the set of individuals universally quantified over (e.g. Eckardt 1999) (see discussion and criticism of these and other suggestions in Greenberg 2003, 2004. For useful reviews of exceptions-tolerance mechanisms see Krifka et al. 1995; Pelletier & Asher 1997). In section 2 below I will concentrate on another suggested mechanism, namely Kadmon and Landman's (1993).

2.2 Reported differences

However, despite the impressive success of the uniform representation above to account for the similarities between minimally contrasting IS and BP sentences, it cannot be the whole story. This is because, in addition to the strong similarities between such minimal pairs, there are also a number of differences between them. Already Burton-Roberts (1977) noticed that some minimal pairs of IS and BP sentences are not really synonymous. Whereas the salient reading of the IS sentence in e.g. (10a) is normative or deontic, most naturally used to tell men how to behave with ladies, the BP counterpart in (10b) can as easily express a descriptive or inductive generalization about all /most gentlemen (although it can also be used to express the normative / deontic rule):

(10) a. A gentleman opens the door for a lady (deontic / normative)

b. Gentlemen open the door for a lady
(Reading 1: descriptive. Reading 2: deontic / normative)

Burton Roberts also noticed that IS sentences express a high level of law-likeness and are many times understood as 'definitional' or 'analytic' statements, so (11a), for example, can be paraphrased as 'To be a table is to have four legs'. In contrast, BP sentences, like (11b) can also express weaker generalizations, which, although still nonaccidental (and supporting counterfactuals), their level of 'law likeness' is lower. On this reading BP sentences are understood as 'descriptive' or 'inductive' generalizations, about patterns (rather than rules), concerning, e.g. the number of legs that tables generally have:

(11) a. A table has four legs

b. Tables have four legs

An even more striking difference between the two types of generics is the restricted distribution of IS sentences, relative to their BP counterparts. The contrast has been already observed by Lawler (1973) and Burton-Roberts (1977) for pairs as in (12), and is further illustrated by the pairs in (13)–(15), reported in Greenberg (2003) (see also Cohen 2001 for similar observations). In all these pairs the IS sentences are infelicitous or odd on the generic reading (although some of them (e.g. (13a–15a) are felicitous as existentials). In contrast, the BP counterparts are perfectly felicitous on the generic reading:

(12) a. #A madrigal is popular / #A room is square / #A man is blond / #An uncle is garrulous

b. Madrigals are popular / Rooms are square / Men are blond/ Uncles are garrulous

(13) a. #A French linguist born in 1954 to a famous singer writes very technical papers

b. French linguists born in 1954 to famous singers write very technical papers

(14) a. #I noticed that a thick book with a red paperback cover deals exactly with your dissertation topic

b. I noticed that thick books with red paperback covers deal exactly with your dissertation topic

(15) a. #An Italian restaurant is closed tonight / #An accountant is very busy today / #An earthquake is especially strong today

b. Italian restaurants are closed tonight / Accountants are very busy today / earthquakes are especially strong today[2]

How can these differences be explained? Notice that if we change IS sentences as in, e.g., (12) or (13) to (16a) and (16b), respectively, they sound much better as generics. Additionally, adding some context to infelicitous IS sentences renders them much better, as can be seen in (17):

(16) a. A Swede is blond

b. A French linguist educated in the fifties in this university writes very technical papers

(17) In Japan, a room is square

Notice, on the other hand, that not all kinds of contextual support can improve the status of infelicitous IS sentences in the same way. (18) is infelicitous as a generic (although fine as an existential) when uttered out of the blue, but whereas the context in (19a) clearly makes it much better as a generic, in the context in (19b) the salient reading of this sentence is still existential. In contrast the BP (20a) is perfectly fine as a generic when uttered out of the blue, as well as in *both* contexts (20b) and (20c):

(18) A Norwegian students whose name ends with 's' or 'g' wears thick green socks. (saliently existential)

(19) a. There are very interesting traditions in Norway concerning professions and names. For example, A Norwegian student whose name ends with 's' or 'g' wears thick green socks. (saliently generic)

b. I walked in the dorms for a couple of nights and noticed that a Norwegian student whose name ends with 's' or 'g' wears thick green socks. (saliently generic)

(20) a. Norwegian students whose name ends with 's' or 'g' wear thick green socks. (saliently generic)

b. There are very interesting traditions in Norway concerning professions and names. For example, Norwegian students whose names end with 's' or 'g' wear thick green socks. (saliently generic)

c. I walked in the dorms for a couple of nights and noticed that Norwegian students whose names end with 's' or 'g' wear thick green socks. (saliently generic)

The facts in (16–19) seem to indicate that the restrictions on the felicity of IS sentences involve context dependence and / or real world considerations, and are, at least in part, pragmatic in nature. However, trying to characterize precisely these pragmatic restrictions, to understand why it is that IS but not BP sentences are sensitive to them, and to connect them to the analytic / normative vs. 'descriptive' contrast between these two types of generics (noted by Lawler and Burton Roberts and mentioned above) are not easy or trivial tasks. Relating to Lawler's original

[2]In Greenberg (1988, 2002, 2003) I showed that temporally restricted BP sentences as in (15b) are indeed (I-) generic, and not e.g. functional (in Condoravdi's 1997 terms). E.g. they support counterfactuals, tolerate legitimate exceptions and obey Cohen's (1999) 'homogeneity constraint', just like standard (I-) generics like *Dogs have four legs*.

data, Krifka et al. (1995:13) admit that "the distinction is clear, and (it) manifests itself in striking results, but the underlying reason is not clear".

Perhaps this is why although several researchers mentioned the observations about the differences between IS and BP generics, almost none attempted to integrate these differences into their theories, and almost all continued to assign IS and BP sentences an *equivalent* semantic representation. In contrast, a few theories (e.g. Krifka 1987; Cohen 2001; Dobrovie-Sorin & Laca 1996; Delfitto 1997) took the opposite approach, and suggested assigning the two types of generics two *completely different* (mainly quantificational and predicational) semantic structures. However, besides specific shortcomings of these attempts (see a detailed discussion in Greenberg 2003, 2004), neither the 'equivalent representations' nor the 'different representations' approach can successfully and simultaneously explain *both* the strong similarities and differences between these two types of generics. Doing that is the main task undertaken in Greenberg (2003).

2.3 Greenberg (2003): capturing both similarities and differences

The main intuition in Greenberg (2003) (see also Greenberg 1988, 2002) is that both IS and BP sentences express nonaccidental generalizations, but that they differ in the type of nonaccidentalness they express. Formally, that both have the same basic, quantificational-modal, representation (in the style of e.g. Krifka et al. 1995; Chierchia 1995, 1998, seen in e.g. (2) above), but they differ in the type of modality, i.e. in the set of worlds where the generalization is asserted to hold. Specifically, whereas IS sentences can only express what I call 'in virtue of' generalizations, and thus, their Gen operator can only be restricted by an 'in virtue of' accessibility relation, BP sentences can potentially express both 'in virtue of' and 'descriptive' generalizations, and their Gen operator is also compatible with a 'descriptive' accessibility relation[3]. The following two sections briefly discuss the intuition behind the difference, and the way to formally capture it. For ease of presentation I concentrate in this review, and in the remaining part of the paper, on quantification and tolerance of individuals only. However, anything said from now on can be straightforwardly applied also to the quantification over situations, and to their tolerance. In addition, the truth conditions presented in these subsections completely ignore the exceptions puzzle, to which I turn back again in section 4.

2.3.1 IS sentences express only 'in virtue of' generalizations

According to Greenberg (2003) IS sentences, like *A dog has four legs* or *A boy does not cry* are restricted to express only 'in virtue of' generalizations. That is, they assert that the generalization they express is true in virtue of a certain property, that the speaker has in mind, and the listener is supposed to accommodate. Following the works of Kratzer (1981) and Brennan (1993) on nongeneric root modality, the 'in virtue of' property is taken to limit the accessibility relation in a systematic way. Suppose, for example, you hear (21a), and the 'in virtue of' property you accommodate is something like 'has a 4 legged genetic makeup'. In this case the sentence will be interpreted as in (21b):

[3]In Greenberg (2003) I suggested how the difference in the compatibility with an 'in virtue of' or 'descriptive' accessibility relation is indirectly derived from the property / kind denotation difference between IS and BP NP subjects, and related it to the classical D / I genericity difference in minimal pairs like *Dodos are extinct* and **A dodo is extinct*.

(21) a. A dog has four legs (in virtue of having a four legged genetic makeup)

b. $\forall w'[\forall x$ dog$(x, w') \rightarrow$ has a four legged genetic makeup$(x, w')] \rightarrow [\forall x$ dog$(x, w') \rightarrow$ has 4 legs$(x, w')]$
(Paraphrase: 'In all worlds where every dog has a four legged genetic makeup, every dog has four legs.')

Or suppose you hear (22a), and you accommodate 'in virtue of being tough', then the sentence will have the interpretation in (22b):

(22) a. A boy does not cry (in virtue of being tough)

b. $\forall w'[\forall x$ boy$(x, w') \rightarrow$ tough$(x, w')] \rightarrow [\forall x$ boy$(x, w') \rightarrow \neg$ cry$(x, w')]$
(Paraphrase: 'In all worlds where every boy is tough, every boy does not cry.')

Clearly, it is the combination of subject and VP which determines which 'in virtue of' property will be most reasonable to accommodate. Thus, although (23a) has the same VP as (21a) (i.e. 'has four legs'), we clearly do not accommodate the same 'in virtue of' property (i.e. has a four legged genetic makeup). Instead, a reasonable 'in virtue of' property to accommodate is something like "being planned to have four legs", which will lead to the interpretation in (23b):

(23) a. A table has four legs (in virtue of being planned to have four legs)

b. $\forall w'[\forall x$ table$(x, w') \rightarrow$ being planned to have four legs$(x, w')] \rightarrow [\forall x$ table$(x, w') \rightarrow$ has 4 legs$(x, w')]$
(Paraphrase: 'In all worlds where every table is planned to have four legs, every table has four legs.')

There are also sentences where, when uttered out of the blue, it is hard to determine which 'in virtue of' property the speaker has in mind. (24) seems to be one such sentence:

(24) An accountant in this place hardly pays taxes

a. In virtue of being covered by the local legislation...
b. In virtue of being deeply dishonest...
c. In virtue of earning almost nothing (since accountants are not needed here)...
d. In virtue of having the right connections with the mayor...

In the absence of supporting context, the listener may end up accommodating the 'wrong' property, i.e. not the one that the speaker has in mind. What is crucial, though, is that hearing such a sentence, the listener still assumes that there is, indeed, a unique 'in virtue of' property that the speaker has in mind, which he has to accommodate. This is very similar to what happens with Kratzer's (1981) examples of circumstantial, nongeneric modality. Hearing e.g. (25), out of the blue, there are several possible 'in view of' components:

(25) I cannot play the trombone

a. In view of the condition of my trombone...
b. In view of the condition of my throat...
c. In view of my musical capacity...
d. In view of my mood...

Kratzer claims that until one 'in view of' is chosen, and in her framework, until one accessibility relation is fixed, we do not get a proposition. My claim is that essentially the same thing holds for IS sentences, which express 'in virtue of' generalizations.

The general form of 'in virtue of' generics, then, is as in (26), where P stands for the subject property, Q, for the VP property and S_C for a contextually supplied property S, which functions as the 'in virtue of' property in the sentence:

(26) $\forall w'[\forall x P(x, w') \rightarrow S_C(x, w')] \rightarrow [\forall x P(x, w') \rightarrow Q(x, w')]$
(Paraphrase: 'In all worlds where every P individual has the contextually supplied S property, every P individual has the Q (i.e. VP) property.')

How can the presence of an 'in virtue of' property in the accessibility relation of IS sentences help us explain the fact that the felicity of so many such sentences is limited, and dependent on real world knowledge? Greenberg (2003) argues that although the choice of the 'in virtue of', S, property indeed varies and is supplied by context, not any arbitrary property can be chosen for this role. Rather, the choice of the 'in virtue of' properties is limited in a systematic way. Clearly, if there were no limitation on the choice of 'in virtue of' properties, then we could accommodate for a false IS like *A dog has three legs* any property we want, including something like 'in virtue of having a *three* legged genetic makeup', and thus wrongly get it, and any other false IS sentence, to be true. Crucially, the limitations on the choice of appropriate 'in virtue of' property, seem to be based on our shared real world knowledge about the subject property (e.g. being a dog), the VP property (e.g. having four legs), and the connection between them. In Greenberg (2003) I identified two such limitations, or requirements on the choice of the 'in virtue of' property and claimed that they are presuppositional in nature.

The first presuppositional requirement is that the 'in virtue of' property must be one which is 'associated', given the common ground, with the subject property. Intuitively, we associate with the property of being a dog properties like 'has a four legged genetic makeup', 'barking' , 'being loyal to its master' etc., but not e.g. 'has a three legged genetic makeup' or 'being black' etc. Similarly, 'being tough', 'being a male', 'loving sports', but not e.g. 'having brown hair' are usually associated with being a boy. A property S is associated with a property P in a world w iff the universal statement $\forall x P(x) \rightarrow S(x)$ follows from some set of shared set of known facts, norms, or stereotypes in w, i.e. if this universal statement holds in all worlds which are epistemically, deontically or stereotypically etc, accessible from w[4] In still other words, iff the statement $\forall x P(x) \rightarrow S(x)$ is taken as some sort of an epistemic, deontic etc. necessity in w.

A sentence like *A dog has three legs*, then, comes out perfectly felicitous since the association presupposition is easily met – we can easily find properties which are associated with being a dog, which will fulfill the position of S in (26) above: having a tail, being loyal, having a four

[4]More formally, a property $^{\wedge}S$ is associated with a property $^{\wedge}P$ in w iff there is an epistemic, deontic, stereotypical, or linguistic accessibility function f from worlds to sets of propositions such that $\forall w''[w'' R_f w] \rightarrow [\forall x[P(x, w'')] \rightarrow [S(x, w'')]]$.

I.e. $^{\wedge}S$ is associated with $^{\wedge}P$ in w iff $\forall x P(x) \rightarrow S(x)$ holds in all worlds
epistemically accessible from w (where the facts known in w hold), OR
deontically accessible from w (where what is commanded in w holds), OR
stereotypically accessible from w – (where the stereotypes in w hold), etc.
linguistically accessible from w (where the language is interpreted as in w)

legged genetic makeup, being descendents of the wolves, etc. This sentence, however, is correctly predicted to be false, since no matter which such associated property we have in mind, we won't find any which leads to having three legs.

In contrast, if we cannot find any property which is associated with the subject property, to fill the position of S in (26), the presuppositional requirement is not met, so the IS sentence is not merely false, but infelicitous as generic. For example, the reason for the infelicity of generic IS sentences whose subjects denote 'extremely unnatural classes', like (18) above, repeated here as (27) is that in the null context we do not have (nontrivial) shared knowledge, norms or beliefs about properties like being a Norwegian student whose name ends with 's' or 'g'. Thus, there is simply no (nontrivial) property we associate with the subject property, so the 'association' presupposition fails.

(27) #A Norwegian student whose name ends with 's' or 'g' wears thick green socks (fine as existential)

What supports this idea is the fact, noted above, that some sorts of contextual support, as in (28) can significantly improve the generic interpretation of such sentences as generic:

(28) Context: There are very interesting traditions in Norway concerning professions and names. For example, a Norwegian student whose name ends with 's' or 'g' wears thick green socks. (Saliently generic)

(28) is much better as a generic than the 'out of the blue' (27), since having the context in (75) in mind, we can rather easily associate some property with being a Norwegian student whose name ends with 's' or 'g', namely that of obeying certain Norwegian traditions. In more intuitive terms, the context in (28) turns the 'extremely unnatural' property of being a Norwegian student whose name ends with 's' or 'g' into a more natural property, namely into one which we can associate other nontrivial properties with. In contrast, nothing in the 'inductive' context in (29) leads to associating a property with being such a Norwegian student, so, the generic reading is still hard to get:

(29) I walked in the student dorms for a couple of nights and noticed that a Norwegian student whose name ends with 's' or 'g' wears thick green socks. (Saliently existential)

The second presuppositional requirement on the choice of the "in virtue of", S property in (26) above is that, in addition to being associated with the subject property, S should be taken to be a 'reasonable causer' for properties of the sort of the VP property, from the point of view of the actual world[5]. Consider, for example, the difference between the false but felicitous *A dog has three legs*, and the infelicitous *#A man is blond*. The former sentence, as we said, is false since among all properties associated with being a dog, none is taken to lead to 'having three legs'. This sentence is felicitous, however, since both presuppositional requirements on the choice of the 'in virtue of' property are met: First, we can easily find some property associated with being a dog, and second, at least one of these associated properties is taken to reasonably lead to 'having

[5]Formally, a property $^\wedge S$ is taken to reasonably cause properties of the sort of $^\wedge Q$ in w iff there is a good possibility (relative to w) that $[\forall x[P(x) \wedge S(x)] \rightarrow Q(x)] \vee [\forall x[P(x) \wedge S(x)] \rightarrow \neg Q(x)]$. I.e. iff $^\wedge S$ is such that there is a good possibility, from the point of view of our world, that either every P individual with S has Q, or every P individual with S does not have Q.

a specific number of legs' (i.e. to a property of *the sort of* 'having three legs'). In contrast, with *#A man is blond* only the first presupposition is met. Although there are many properties we associate with the property of being a man ('having male organs', 'loving sports', etc.), none of these properties is taken to reasonably lead to being blond (which would make the sentence false), and none is taken to reasonably lead to having a specific hair color (i.e. to a property of the sort of 'being blond').

Greenberg (2003) brings many examples which further illustrate that when even one of the two real-world-based presuppositional requirements on the choice of the 'in virtue of' properties is not met and no appropriate 'in virtue of' reading can be accommodated, the 'in virtue of' reading, which is the only generic reading available for IS sentences is blocked, and the IS sentence is infelicitous.

2.3.2 BP sentences can express both 'in virtue of' and 'descriptive' generalizations

Let us turn now to BP sentences, like *Dogs have four legs*, *Boys don't cry* and *Men are blond*. In Greenberg (2003) I claimed that, in contrast to IS sentences, BP sentences are ambiguous. They can express 'in virtue of' generalizations, just like their IS counterparts, but also what I call 'descriptive' generalizations, where they merely assert something like 'there is a pattern here', or 'the generalization is nonaccidental'. Crucially, in asserting a descriptive generalization there is no attempt on the side of the speaker to convey the property, or factor in virtue of which the generalization is true, and thus there is no commitment on the side of the listener to accommodate such an 'in virtue of' factor. Consequently, and unlike what happens with 'in virtue of' generalizations, where the accommodated 'in virtue of' factor limits the set of accessible worlds, with descriptive generalizations we do not characterize in what exact sense the possible worlds in which the generalization is asserted to hold are similar to the actual world. That is, in choosing the accessible worlds for descriptive generalizations we do not define the exact 'criterion of similarity' with the actual world. All we claim is that 'the generalization is not accidental', i.e. that it is not limited to actuality, but expected to hold also in other, nonactual circumstances, similar to ours, where, crucially, this similarity remains unspecified.

In Greenberg (2003) I defined this unspecified type of similarity between the accessible worlds quantified over and the actual world along the line of Stalnaker's (1968) maximal similarity, or Lewis's (1973; 1986b) overall similarity. For our purposes, a world w' is defined as maximally similar to w_0 (written $w' \, R_{max} w_0$) iff it is maximally similar to w_0 (in the Stalnakerian/ Lewisian sense), except from what is needed to allow for the existence of nonactual members of the subject set.

Consider, for example, a BP sentence like *Boys don't cry*. This sentence is ambiguous, so it can express both an 'in virtue of' generalization, just like its IS counterpart *A boy does not cry* (asserting that 'every boy does not cry' holds in all worlds where, e.g. 'every boy is tough'), but also a 'descriptive' generalization. This latter reading is especially appropriate as a conclusion of some inductive inference. We can imagine for example an alien from Mars trying to find information about humans on Earth. After observing the behavior of many boys he may report to his commander that 'Boys don't cry'. Uttering this sentence, all he is asserting is that the generalization 'all boys don't cry' is not accidental, i.e. he expects it to hold not only for actual boys (in actual situations), but also for nonactual boys, in other possible, nonactual circumstances. But crucially, his utterance does not involve, not even in an implicit way, the factor in virtue of which the generalization holds. Maybe he does not even know what the 'in virtue of' factor is,

and even if he has some hypothesis about this factor, conveying it is not an integral part of the BP assertion. Thus, under this descriptive reading this speaker does not specify in which exact sense are the relevant nonactual worlds in which the generalization holds are similar to actuality, and his listener is not committed to accommodate this exact sense of similarity. The sentence, then, has an interpretation along the lines of (30):

(30) a. Boys don't cry (descriptive reading)

b. $\forall w'[w' \in \{w_0\} \cup \{w'' : w'' R_{max} w_0\}] \rightarrow [\forall x boy(x, w') \rightarrow \neg cry(x, w')]$
(Paraphrase: 'In all worlds in the union set of w_0 and all those worlds which are maximally similar to w_0 except from what is needed to allow for the existence of different / nonactual boys – every boy does not cry.')

The ability of BP sentences to express descriptive generalization is the reason BP counterparts of infelicitous IS sentences are themselves perfectly felicitous as generic, as seen again in (31):

(31) a. Men are blond (cf. #A man is blond)

b. Tall lawyers whose names end with 't' love marshmallows
(cf. #A tall lawyer whose name ends with 't' loves marshmallows)

c. Thick books with red paperback covers deal exactly with that topic
(cf. #A thick book with a red paperback cover deals exactly with this topic)

As claimed above, the infelicity of the IS counterparts indicates that the 'in virtue of' reading – which is the only reading for generic IS sentences – is blocked as a result of failure of a presuppositional requirements on the choice of the 'in virtue of' property. But the BP sentences can also express 'descriptive' generalizations, whose accessibility relation is not sensitive to the same real world based presuppositional restrictions that 'in virtue of' accessibility relations are sensitive to. Hence such sentences are perfectly felicitous. What will be crucial for us below is that such BP sentences whose IS counterparts are infelicitous, are those which are *unambiguously descriptive*.

3 Tolerance of exceptions – Kadmon and Landman's (1993) suggestion for a 'domain vague quantification'

3.1 The intuition: domain vagueness as the reason for tolerance of exceptions

Greenberg's (2003) theory mainly deals with clarifying the nature of the modality (or 'nonaccidentalness) of IS and BP generics. I want to turn now to an application of this theory to another puzzle that IS and BP sentences raise, namely their exceptions tolerance property[6]. At first glance it seems that the two types of generics are identical with respect to the tolerance of exceptions. After all, as mentioned above, both *A dog has four legs* and *Dogs have four legs*, are considered true despite the well known existence of several dogs with less (or more) than four legs, e.g. those who miss a leg as a result of some accident, mutation, operation, etc. In section 3 below, however, I will show that there is, in fact, a newly observed difference between the two types of sentences concerning one aspect of the exceptions tolerance property.

[6] A preliminary version of this application is presented already in Greenberg (2003).

Before doing that, however, let us look at one way of dealing with the exceptions tolerance property in general. I mentioned above several theories which suggested ways to capture this property (e.g. McCarthy 1986; Krifka 1987; Delgrande 1988; Krifka et al. 1995; Eckardt 1999; Asher & Morreau 1995). I cannot, in the scope of this paper, review and discuss these suggestions (but see discussion and criticism of some representative approaches in Greenberg 2003 and 2004). What I want to do here is concentrate on one theory which is, in fact, much less well known in the traditional genericity literature, namely Kadmon and Landman's (K&L, henceforth) suggestion presented in their 1993 'Any' paper.

Like many other theories of genericity K&L take the generic operator – Gen – to be universal, and modalized (quantifying over possible entities). Their innovation, however, is in taking it also to be a 'domain vague' quantifier, and in deriving the exceptions tolerance of generics from this latter property.

First, K&L claim that the domain of quantification of Gen can be contextually restricted by a set of properties. This claim is supported by sentences like (32)–(34) (cited from Greenberg 2003), which in the relevant contexts clearly generalize only over professors who teach in this university, over shirts sold in Jack's shop, etc, over books in this library, etc.[7]. (K&L concentrated on IS generics only, but as (32)–(34) show, contextual restriction works the same for IS and BP sentences):

(32) (Context – There are professors and students in this university) A professor wears a tie / Professors wear a tie

(33) (Context – You should go to Jack's shop. He has beautiful things now, and some of them are so cheap!) A shirt costs only $7! / Shirts cost only $7!

(34) (Context – There are 50000 books and 3000 journals in this library) A book / Books can be borrowed for a week, but a journal / Journals can only be borrowed overnight

However, K&L claim, this type of contextual restriction cannot by itself be the reason for the exceptions tolerance of generics, since many natural language quantifiers have this property, including those which clearly do *not* tolerate exceptions, e.g. 'every', as seen in (35):

(35) (Context: There are professors and students in this university) Every professor wears a tie

Whereas both the universal in (35) and the generics in (32) exclude from quantification the contextually irrelevant professors (e.g. those from other universities), only the generics in (32) can tolerate also exceptional professors from this university. That is, it is only the generics in (32), but not the universal in (35), which are not falsified by the existence of non-tie-wearing professors from *this* university. Thus, it cannot be mere contextual restriction that leads to tolerance of exceptions in generics.

[7]This is, in fact, contra the widely held view that unlike explicitly quantified sentences, generics cannot be contextually restricted. This view is followed in, e.g. Condoravdi (1997) and Krifka et al. (1995) and it is supported by Krifka's (1987) classical example in (ia), where (ib) cannot be taken to be a statement about lions in the cage:

(i) a. (There are lions and tigers in the cage)

b. A lion is dangerous / Lions are dangerous

However, as the examples in (32)–(34) show, many generics can be easily contextually restricted. See Greenberg (2003) and Greenberg (2004) for more examples and a detailed discussion.

What is, then, the reason for the difference between *every* and Gen? K&L propose the following answer: With standard universals, the restricting set of properties is precise: the assumption is that the speaker has in mind a precise set of restricting properties, even if he does not specify them explicitly, and the listener is supposed to accommodate this set, (many times, with the help of context). The result is that no (contextually relevant) individual can be excluded from the quantification, i.e. all individuals with the accommodated, contextually relevant properties are quantified over, so no exceptions can be tolerated.

What is special about Gen, as opposed to, e.g. the universal *every*, is that the set of properties restricting it is a **vague** set. Let me quote here K&L:

> For a generic statement there is no well-defined set of objects that the universal statement ranges over. We don't expect the context of utterance to make clear what the objects are exactly that the generalization expressed applies to. And we don't attempt to accommodate a precise set of objects. Hence, when we encounter objects that do not fall under the generalization expressed, there is always the possibility that they are not among the objects that the generalization is supposed to apply to, and we are therefore able to regard them as legitimate exceptions (p. 409). ... What we would like to propose, then, is that it is an integral part of the nature of generic statements that **the restricting set of properties is vague**... Saying An owl hunts mice is just like saying 'every (possible) owl with the right properties hunts mice', while, crucially not committing yourself to what the right properties are. (p. 408, original emphasis)

3.2 Kadmon and Landman's formalization: A supervaluationist treatment of the domain vagueness

K&L's goal is to capture *both* the contextual dependency of Gen (illustrated in (25)–(27) above), as well as its vagueness, i.e. the fact that even when contextual support *is* available, not all properties restricting Gen are known to the speaker and supposed to be accommodated by the listener. Thus, K&L take the set of properties restricting Gen to be a *pair*: $\langle v_0, V\rangle$, where v_0 represents the precise part of the restriction, supplied directly by context, and V represents the vague part. Consider again, for example, the sentences in (36a), represented now as in (36b):

(36) a. (*Context*: There are professors and students in this university)
A professor wears a tie / Professors wear a tie

b. $\forall \uparrow X_{\text{professor}}[\text{professor}][\text{wears a tie}]$ (Paraphrase: 'Every individual with all the properties in the restriction $X_{\text{professor}}$, is a professor who wears a tie.')

The restriction, $X_{\text{professor}}$ is a pair $\langle v_0, V\rangle$, where v_0 is the precise part of the restriction, namely a (possibly empty) consistent set of properties, compatible with the property 'professor'. This set of restricting properties is directly provided by the context, and is accommodated by the listener. In the case of (36), v_0 contains the contextually supplied property 'in this university', so only professors in this university are quantified over in the first place.[8]

[8]As pointed out by an anonymous reviewer, handling contextually irrelevant individuals through domain restrictions, as done in K&L, may lead to problems with some cases of generic anaphora, as in (i):

The second member of the pair – V – is the vague part of the restriction $X_{\text{professor}}$. K&L follow the supervaluationist approach to vagueness, originally developed by e.g. Kamp (1975) and Fine (1975) to deal with vague predicates like *tall*, *bald*, etc. (see also Landman 1991; Kyburg & Morreau 2000; Barker 2002). The core characteristic of vagueness, according to this approach, is that there are various possible ways to resolve it and get to a precise statement, or, using Fine's terminology various possible 'precisifications'. Crucially, there is no systematic way to determine which of these precisifications is better than the others – each is as good as all the others. Following this line of thought, K&L define the vague part of the restriction on Gen, V, as a set of precisifications on v_0 – i.e. as a set of sets of properties. Each precisification in V (=each set of properties) is consistent and is a superset of v_0 (i.e. contains the properties which was directly supplied by the context).

In the case of (36), for example v_0 and V in the restriction $X_{\text{professor}}$ can be represented as in (37a) and (37b), respectively, where each numbered P represents a property:

(37) a. v_0 (the set of contextually supplied properties): {in this university}

b. V = The set of precisifications on v_0:
{{in this university, P1, P2, P3},
{in this university, P1, P4, P5},
{in this university, P4, P2, P6},
{in this university, P7, P8, P9},
...
...}

Each precisification, i.e. each set of properties in V, represents one possible way of making the restriction precise, (which is compatible with what is already known from the context, i.e. with 'in this university). Crucially, there is at least one context where we do not determine which of these 'ways of making the restriction precise' is better than others. That is, there is at least one context where we do not choose a unique set of restricting properties, and where all of them are potentially available to the speaker and the listener.

The result is that if you encounter a professor in this university who does not wear a tie, there is always the possibility that there is one or other properties in one of the unchosen precisifications that this professor lacks. Thus, such a professor can be considered a legitimate exception, i.e. one which is possibly not covered by the universal quantification, so his existence does not falsify the generalization. In addition, unlike the properties of the contextually irrelevant individuals, that the listener is expected to fully accommodate, we get built-in vagueness concerning the properties of the legitimate exceptions. This is a welcome result, according to K&L, because of their intuitive observation that speakers of generic sentences do not really determine in advance which types of individuals will be considered legitimate exceptions, and which will not (for further empirical support for this intuition see Greenberg 2004).

(i) Pheasants lay eggs. They are hunted in the fall.

The problem is that (i) may be true even if only male pheasants are hunted in the fall, although, naturally, only female ones lay eggs. If we exclude male pheasants in the first sentence in (i) through the property "be a female", we have no way to account for the opposite domain restriction in the anaphoric pronoun 'they'.

4 Why K&L's domain vague restriction is *too* vague – two types of further restrictions

I believe K&L's basic suggestions – that generics are domain vague, and that it is their domain vagueness which leads to their tolerance of exceptions – are right. Nonetheless, I think the original suggestion cannot be the whole story, and that it should be modified.

The main reason for that is that K&L's 'domain vague' restriction is, in fact, too vague. This is because there is no limitation in their theory on which properties can be part of the precisifications, and which can not. Put in other words, in K&L's original theory 'anything goes' in the restriction, that is, any property what so ever can be part of the precisifications (excluding only those which are incompatible with the subject property, and which lead to an inconsistent set). Consequently, an implicit prediction of K&L's theory that we know nothing about the potential properties of the exceptions. Here too 'anything goes' – that is, any property what so ever can be taken to legitimize exceptions to a generic sentence.

In reality, however, not any property can be used to legitimize exceptions. There are two limitations that language users impose on the properties in the precisifications, and thus, on the properties of the legitimate exceptions. These two limitations are systematic, in that they are made in every context of use. Thus, the domain vagueness of generics is systematically reduced, or limited in two different ways.

As I will show in section 4, the nice part about these two types of 'vagueness reduction' operations is that they correlate with the two types of generalizations argued for in Greenberg (2003) – the 'in virtue of' and the 'descriptive' ones. Before arguing for this correlation, though, let me describe the two limitations on the vague restriction.

4.1 The first limitation on the vague restriction – 'abnormality'

The first limitation on the domain vague restriction of generics can be called 'abnormality', and it holds equally for IS and BP generics. As already mentioned in section 1 above, there is a strong intuition, shared by many theories of genericity, (see e.g. Delgrande 1988; Asher & Morreau 1995; Pelletier & Asher 1997; Condoravdi 1997; Eckardt 1999), that the exceptions to generic sentences (both IS and BP ones) are legitimate to the extent they are considered in some sense 'abnormal', or 'nonstandard'. I will reparaphrase this intuition like this: the legitimate exceptions to a generic are those which, besides not having the VP property, are exceptional in some other sense as well.

Thus, not *any* property what so ever can legitimize exceptions as in K&L's approach, only those which are taken to be 'abnormal' properties. For example, properties which are taken as appropriate for legitimizing exceptions to the generics in (38a) are e.g. the ones in (38b), but clearly not the ones in (38c):

(38) a. A dog has four legs / Dogs have four legs

b. Yes: having a mutation, undergoing an accident, etc. – properties which are considered 'abnormal' of dogs

c. No: having a tail, barking, being loyal etc. – properties which are considered 'normal' of dogs

It is important to emphasize that in considering exceptions to generic sentences, we have to make sure not to confuse 'abnormal' with 'contextually irrelevant' individuals: In sentences where

context supplies relevant properties, as in, e.g. (33) above (*There are shirts and skirts in this shop. A shirt / Shirts cost(s) about 100 NIS*), we clearly quantify only over those normal shirts which are contextually relevant, e.g. over the normal shirts in this shop – those which constitute the significant majority of shirts in this shop. So exceptional shirts are not those in other shops (such shirts are considered contextually irrelevant), but rather shirts in this shop which are, in some sense, 'abnormal' – e.g. those which are damaged, too old, etc.[9]

Notice also that we can accept a generic as true even if we do not know exactly the additional exceptional properties of the legitimate exceptions. It is enough that we assume that these additional exceptional properties exist. Suppose, for example, we hear *A professor wears a tie / Professors wear a tie* in the context of talking about this university, and you notice that Bill, a professor in this university, does not wear a tie. We can take Bill to be a legitimate exception to the generic (i.e. as not falsifying the generalization) on the assumption that he has some additional exceptional property besides not wearing a tie, which is the reason for his not wearing a tie, even if we don't know what this property is.

The 'abnormality' intuition has direct implications for the vague restriction on the Gen quantifier. The intuition developed above is that unlike K&L's original assumptions, it is clear now that not 'anything goes' in the restriction, that is, not any property can be part of it. Instead, we have to guarantee that in every context c, besides the contextually relevant properties directly supplied by c (i.e. those in v_0), any property in any precisification in V is one which is considered a 'normal' property of the individuals denoted by the subject set in c. Thus, we end up quantifying only over the individuals which are considered "abnormal" for the subject set, as desired.

How can we define 'abnormality'? Most theories which attempted to formalize the 'abnormality' intuition (e.g. McCarthy 1986; Delgrande 1988; Asher & Morreau 1995; Krifka 1995; Pelletier & Asher 1997; Eckardt 1999) use in their definition the unanalyzed adjective '(ab)normal' itself. I would like, in contrast, to give some more precise content to this intuition. One way to do that is to define 'abnormal' as 'true of the significant minority'. The idea is that if in a context c a certain property is assumed to hold of the significant minority of (contextually relevant) subject set individuals, then individuals with such properties are considered 'abnormal', and are thus potentially not quantified over and can be considered legitimate exceptions. (39) is an attempt to make this idea precise:

(39) *The 'abnormality' limitation on K&L's domain vague restriction*: Let P be a subject property and $\uparrow X_{\mathbf{P}}$ K&L's domain vague restriction where v_0, is a set of properties and V a set of precisifications on v_0. Then any set of properties v in V is such that: $|\bigcap v \cap P \; in \; c|$ is not significantly smaller than $|\bigcap v_0 \cap P \; in \; c|$

(39) says that that the number of the P individuals who have the properties in any of the precisifications v in V (and are thus quantified over by Gen), is not significantly smaller in the context c,

[9]The distinction between contextually irrelevant and legitimately exceptional abnormal entities is not limited to individuals, but also to situations quantified over by Gen. These two mechanisms are sometimes not well distinguished in the literature. For example, male snakes are often considered legitimate exceptions to sentences like *Snakes lay eggs* often cited in the generic literature (see e.g. Krifka et al. 1995; Pelletier & Asher 1997). However, once we develop mechanisms for treating both contextually irrelevant and legitimately exceptional individuals and situations, male snakes should not be considered 'exceptions' to such a sentence (indeed, no one would want to claim that being male is an 'abnormal' property of snakes?). Instead, their tolerance can be achieved through the mechanism responsible for excluding contextually irrelevant situations (in this case by taking only giving birth situations, which naturally do not involve male snakes, to be contextually relevant situations).

than the number of relevant P individuals as a whole[10]. To illustrate how this definition works consider the IS or the BP generic in (40):

(40) (Context: in this school) First graders finish at 13.00 / A first grader finishes at 13.00.

Given K&L's approach, the subject property 'first grader' is restricted by a domain vague restriction, $\uparrow X_{\text{first grader}}$, with a precise part v_0, which contains in our case the singleton set $\{$in this school$\}$, and a vague part, which is a set of precisifications on v_0, namely a set of sets of properties, each of which is a superset of $\{$in this school$\}$. Unlike K&L's original restriction, not 'anything goes' in the precisifications. Instead, given (39), every precisification v in V is limited in the following way:

(41) $|\bigcap v \cap$ first grader in $c|$ is not significantly smaller than $|$in this school $\cap$ first grader$|$ in c

(41) says that, no matter which properties we put in a precisifications in $\uparrow X_{\text{first grader}}$, the result of intersecting all the properties in any precisification with the set of first graders is not significantly smaller than the set of contextually relevant first graders, i.e. those in this school. Put in other words, limiting the domain vague restriction $\uparrow X_{\text{first grader}}$ through the 'abnormality' limitation will be always equal in this context to quantifying over the significant majority of first graders in this school.

A direct consequence of using (39) is that not only the *intersection* of properties in any v holds of the majority of (relevant) individuals (e.g. of first graders in this school), but also any *single* property in any precisification in V is necessarily a property of the majority of relevant individuals, i.e. a 'normal' property. This is because if we were trying to intersect a property of the *minority* with all other properties in v, the intersection could never yield the majority of (relevant) individuals, as required by (39). In the case of (40), for example, we can never put in any precisification v in V a property which in the context of utterance is taken to be a property of the minority of first graders in this school, e.g. the property of not having a school bag. If we were trying to do so, then $|\bigcap v \cap$ first grader$|$ in (41) above would immediately come out as significantly smaller than $|$in this school $\cap$ first grader$|$. Thus, the precisifications in $\uparrow X_{\text{first grader}}$ can only contain properties which are themselves true of the significant majority of first graders in this school, like 'having a school bag', i.e. only 'normal' properties. This directly means that individuals with a negation of such a property of the majority, e.g. individuals with *no* school bag, are not quantified over, and are therefore considered legitimate exceptions to the generalization. We thus correctly capture the intuition that only 'abnormal' properties – in our terms, only properties which in the context of utterance are taken to hold of the significant minority of relevant P individuals – are exceptions-legitimizers.

[10]Here and below we can think about a context c as a set of worlds, each of which is a candidate for being the actual world w_0, as in dynamic semantic approaches.

4.2 The second further limitation on the vague restriction

The second limitation on the set of precisifications is more interesting, and it concerns a newly-observed difference between IS sentences, exemplified in (42), and those BP sentences whose IS counterparts are infelicitous as generics, exemplified in (43).

(42) A sparrow has four toes on each leg

(43) Tall carpenters whose names end with 't' love marshmallows (cf. #A tall carpenter whose name ends with 't' loves marshmallows)

With IS sentences, as in (42), the limitation on the vague restriction appears, in fact, to be stricter than the 'abnormality' limitation. Put in other words, merely having an 'abnormal' property is not enough to legitimize exceptions to an IS sentence. With such sentences we are able to systematically distinguish 'abnormal properties' which count for legitimizing exceptions, from those abnormal properties which do not count. Consider, for example, the legitimate exceptions to the IS sentence in (42), repeated in (44). For example, although the properties in both (44a) and (44b), can be safely considered 'abnormal' properties of sparrows, we will naturally take only the former, and clearly not the latter properties, to legitimize exceptions to this generic sentence:

(44) A sparrow has four toes on each leg

a. *Properties legitimizing exceptions*: being caught by a cat / participating in a raging battle for their territory / undergoing a mutation in gene responsible for the number of toes / being part of a cruel scientific experiment checking how sparrows manage to survive after they have one toe cut off / undergoing a car accident...

b. *Properties not legitimizing exceptions*: having a problem in the vocal cords / reading papers in Semantics / being infertile / having five names ending with 'g' / knowing how to swim...

Consider, in contrast, BP sentences like (43), whose IS counterparts are infelicitous. With such sentences it is much harder, if not totally impossible, to tell which abnormal properties count, and which do not count for legitimizing exceptions. What are, for example, the legitimate exceptions to (43) ('Tall carpenters whose names end with 't' love marshmallows')? Those who are exceptionally rich? exceptionally poor? exceptionally fat? exceptionally thin? those who make only yellow, round tables? those addicted to yellow cheese? those who have more than ten children?

Unlike what happens with IS sentences, as in (44), in (43) it is really hard to tell. The intuition is that, in thinking about which properties make a carpenter whose name ends with 't' a legitimate exception to (43), any 'abnormal' property of such carpenters can equally count. Unlike what we could easily do with the IS sentence, here we cannot distinguish among the abnormal properties those which definitely legitimize exceptions, as opposed to properties which definitely don't, so all 'abnormal' properties have the same status. Put in other words, although we can predict that the exceptions to this BP sentence are in some sense or other 'abnormal', unlike what happens with IS sentences we do not know what is the exact 'sense' in which these properties are 'abnormal', so any abnormal property will do. The result is that with this BP sentences we end up being in a much vaguer state concerning the properties of the exceptions.

The inability to characterize the properties of the exceptions is not limited to (43), but can be felt with the other BP sentences whose IS counterparts are infelicitous as generic, examined in section 1.2 above and repeated here as (45)–(48) (the (b) sentences illustrate again the infelicity of the IS counterparts):

(45) a. Madrigals are popular / Rooms are square / Men are blond/ Uncles are garrulous

b. #A madrigal is popular / #A room is square / #A man is blond / #An uncle is garrulous

(46) a. French linguists born in 1954 to famous singers write very technical papers

b. #A French linguist born in 1954 to a famous singer writes very technical papers

(47) a. I noticed that thick books with red paperback covers deal exactly with your dissertation topic

b. #I noticed that a thick book with a red paperback cover deals exactly with your dissertation topic

(48) a. Italian restaurants are closed tonight / Accountants are very busy today / earthquakes are especially strong today

b. #An Italian restaurant is closed tonight / #An accountant is very busy today / #An earthquake is especially strong today

Thinking about all kinds of 'abnormal' madrigals, rooms , uncles, French linguists born in 1954 to famous singers, thick books with red paperback covers, Italian restaurants, accountants and earthquakes, it is very hard to characterize in advance which will be considered legitimate exceptions to (45)–(48) and which will not.

I suggest, then, that there is a systematic correlation between the IS/BP contrast, on the one hand, and the ability to characterize exceptions in advance, on the other hand. We can start by schematically phrasing this (still descriptive) correlation, as in (49):

(49) a. BP sentences with no felicitous IS counterpart ⇒ more vague with respect to properties which legitimize exceptions

b. IS sentences ⇒ less vague with respect to properties which legitimize exceptions

This descriptive generalization, in turn, raises two main questions: First, what is the right way to characterize the distinction with IS sentences, between the abnormal properties which count for legitimizing exceptions, and those which do not count? Second, how can we explain the correlation in (49) in the first place? That is, what does the degree of vagueness with respect to exceptions have to do with the IS/BP distinction?

I suggest answers to these two questions in the next section.

5 Deriving the type of the domain vague restriction from the type of nonaccidentalness expressed by the generic

Remember that in section 1 above, based on a variety of semantic, pragmatic and distributional differences between minimally contrasting IS and BP generic sentences, starting from Lawler's classic contrast *Madrigals are popular* vs. *#A madrigal is popular,* I argued in Greenberg (2003)

for the existence of an underlying difference between IS sentences on the one hand, and those BP sentences whose IS counterparts are infelicitous.

According to this view IS sentences are unambiguously 'in virtue of' generalizations. Thus, in every context c, the speaker has in mind, and the listener is supposed to accommodate an appropriate (i.e. pragmatically restricted) 'in virtue of' property. The point I would like make now is that once a language user has in mind in virtue of what the generalization is true, he or she can tell, at least to some extent, which are the properties which definitely characterize the exceptions. Intuitively, these exceptions-legitimizing properties are those which are taken, from the point of view of w, to block the 'natural causation' relation between the 'in virtue of' and the VP property.

Suppose, for example, you hear the IS sentence in (50a), and accommodate that it is asserted to be true in virtue of having a four legged genetic makeup. Then, the properties which you will take to legitimize exceptions to (50a) are those which, from the point of view of our world, are taken to block the natural causation connection between 'having a 4 legged genetic makeup' and 'having 4 legs', that is properties as in (50b), but not as in (50c):

(50) a. A sparrow has four legs (in virtue of having a four legged genetic makeup)

b. Yes: car accidents, mutations, being part of a cruel battle over territory, etc.

c. No: having a problem in the vocal cords, having 5 names, loving formal semantics, etc.

Although properties as in (50b) are clearly taken to be 'abnormal' properties of cats, we do not take them to legitimize an exception to 'A cat has 4 legs', because we do not take them to block the natural causation relation between 'having a four legged genetic makeup' and 'having 4 legs'.

In contrast to IS sentences, in Greenberg (2003) I claimed that BP sentences with no felicitous IS counterparts are those which are unambiguously descriptive, i.e. they are those where the 'in virtue of' reading is blocked since no appropriate "in virtue of" property is available. All we assert in uttering such sentences is that the generalization is nonaccidental, i.e. that it is expected to be true not only in actuality, but in other possible circumstances, similar to ours. But, crucially, we do not attempt to specify in virtue of what the generalization is nonaccidentally true.

Now, if you do not specify (or even know) what leads to the truth of the generalization (i.e. in virtue of what it is true), then it is harder to predict what are the properties which definitely characterize the legitimate exceptions. All we can say is that these properties must be all 'abnormal', but we cannot definitely tell which abnormal properties these are.

Thus, whereas the domain vague restriction with unambiguously descriptive generics (like (34) is limited only by the mere 'abnormality' limitation in (39) above, that of unambiguously 'in virtue of' generics, like *A dog has four legs* is further limited by a stricter limitation, which can be called 'relevant abnormality', requiring all properties in each of the precisifications v in V (excluding the ones in v_0) to be negations of those properties which are taken as blocking the natural causation relation between having the accommodated 'in virtue of' property, and having the VP property. I will not attempt to define here what 'natural causation relation' between properties is, and what 'blocking a natural causation relation' amounts to, but assume that language users have quite strong intuitions about these notions. For example, I assume that language users will agree that having a four legged genetic makeup is a potential reasonable causer for having four legs, but not for being brown, and that having a mutation or an accident, but not, e.g., having problem in the vocal cords can potentially 'block' such a reasonable causation relation.

What I do claim, and intend to capture, is that language users make use of these intuitive notions in characterizing the exceptions to IS generics. Thus, in evaluating (50a), we end up quantifying over all those sparrows who do not have mutations, did not undergo an accident, etc.

As a support for this intuition, notice that there are, in fact, IS sentences, which on the surface seem similar to BP sentences like (43) above, in being much vaguer with respect to the properties legitimizing exceptions, i.e. where it is hard to tell which 'abnormal' properties legitimize exceptions, and which do not. An example for such a sentence is (24) above, when uttered out of the blue (repeated here as (51)):

(51) An accountant in this place hardly pays taxes (out of the blue)

What are the legitimate exceptions to (51)? Is it accountants who earn lots of money? those who earn very little? these who work under the direct supervision of their manager? those who have another job? those who are very new? those who are very old? It is really hard to tell. It seems that the degree of vagueness concerning the properties of the exceptions we get here is very similar to the one we got with a BP sentence like (43) above ('*Tall carpenters whose name end with 't' love marshmallows*'), and clearly much stronger than the one we felt with IS sentences like *A dog has four legs*.

But the reason for this feeling is clear if we remember that, as explained in section 1, IS sentences like (51) are exactly the ones where, when uttered with no supporting context, there is more than one reasonable 'in virtue of' property which can be accommodated. I repeat some of the reasonable 'in virtue of' properties for (51) in (52):

(52) An accountant in this place hardly pays taxes

a. In virtue of being covered by the local tax legislation...
b. In virtue of being deeply dishonest...
c. In virtue of earning almost nothing...
d. In virtue of having the right connections with the mayor...

Notice, importantly, that the unclarity about the choice of the 'in virtue of' property should not be characterized as vagueness, but as genuine context dependence. When uttered in context a speaker *does* choose a unique 'in virtue of', and the listener *is* supposed to accommodate one such property.

Once the sentence is uttered in context, then, and the listener accommodates one 'in virtue of' property, the apparent vagueness with respect to properties of the exceptions, is to a large extent resolved. For example, accommodating 'in virtue of obeying the legislation', we may take 'having an additional job' as legitimizing exceptions to (51), (because this property can be taken as blocking the causation relation between obeying the tax legislation and hardly paying taxes) but not e.g. 'working under the direct supervision of their manager' (because naturally we don't think of such a property as having anything to with the tax legislation). In contrast, accommodating 'in virtue of being deeply dishonest' – we can take 'working under the direct supervision of their manager' as a property legitimizing exceptions (this can be reasonably taken to 'block' the natural causation relation between being dishonest and not paying taxes), but not, e.g. 'having an additional job'.[11]

[11]It is now clear why theories like McCarthy's (1986) and Drewery (1997), which relativize abnormality to the

6 Summary and some directions for further research

The main observation pointed out in this paper was that, in addition to the wide variety of reported differences between minimally contrasting IS and BP generics (starting from Lawler's 1973 classical *#A madrigal is popular* vs. *Madrigals are popular*), there is a newly observed difference between IS sentences on the one hand, and BP sentences whose IS counterparts are infelicitous, on the other, which concerns the degree to which the properties of their legitimate exceptions can be specified. I suggested that once we adopt the claims in Greenberg (2003) that the variety of differences between the two types of sentences result from one underlined difference – namely the compatibility with an 'in virtue of' or a 'descriptive' accessibility relation – the latter difference concerning the tolerance of exceptions is not surprising. Rather it can be naturally (although still intuitively) explained as simply another manifestation of the underlying difference in the type of nonaccidentalness expressed.

Thus, specifying the factor in virtue of which the generalization is asserted to be nonaccidentally true, which is an integral part of the semantics of IS sentences, directly leads to limiting the type of properties which count for legitimizing exceptions (intuitively, only properties which block the 'natural causation' relation between the 'in virtue of' and the VP properties count). In contrast, if no specification of the 'in virtue of' factor takes place, as in unambiguously 'descriptive' BP sentences, we get almost no specification of the type of properties which count for legitimizing exceptions. All we can say about them is that they are 'abnormal' in some sense. But what is the exact 'sense' in which they are abnormal remains vague. I showed how a modified version of Kadmon and Landman's supervaluationist 'domain vague' restriction on Gen can capture the difference between the two types, or degrees, of vagueness with these two types of generics.

The data and analysis presented in this paper raise interesting questions and directions for further research in the field of genericity, as well as in the field of natural language vagueness. Let me conclude this paper by pointing out three of these directions.

First, the intuitively phrased limitation on the restriction of 'in virtue of' generics, which contains notions such as 'reasonable causation' relation between properties, and that of 'blocking' this causation relation, should be made more precise and testable. One promising option for doing so is using a Lewisian style counterfactuals-based treatment of causation and causal chains (see, e.g. Lewis 1986a).

Second, one of the advantages of the present suggestion over the one made in K&L's theory, is that instead of taking law-likeness and domain vagueness to be two unconnected, stipulated properties of natural language generics, it enables us to connect between them, by pointing out the correlation between the type of nonaccidentalness expressed by the generic ('in virtue of' and 'descriptive') and the degree of vagueness with respect to the properties of the exceptions (low or high). However, it would be desirable to make this connection more explicit and explanatory. One direction for doing so is to try and capture also the two types of 'nonaccidentalness' discussed in Greenberg (2003) using a supervaluationist approach. In section 1 above I claimed

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subject property and / or to the predicate (i.e. VP) property, cannot do justice to sentences like (51). Even if we consider individuals who are abnormal with respect to being an accountant in this place and / or with respect to hardly paying taxes, we cannot capture the fact that there can be different types of such abnormal individuals which are considered in different contexts. In the present suggestion, on the other hand, we capture the fact that these types of abnormal individuals are determined by the relation between the accommodated 'in virtue of' property (associated with the subject property in a given context) and the VP property.

that the difference between the 'in virtue of' and the 'descriptive' nonaccidentalness should be defined in terms of two different types of accessibility relations. In the 'in virtue of' one, the similarity criterion of the accessible worlds to the actual one is specified: we look only at those worlds in which every member of the subject set has a property associated with it in w_0 (e.g. with *A dog has four legs*, we look only at the worlds where every dog has a four legged genetic makeup). In contrast, with descriptive generalizations, since we do not specify the actual factor in virtue of which the generalization is true, the similarity criterion of the accessible worlds to the actual one remains much more vague – besides w_0 itself we look at all the worlds which are maximally / overall similar to w_0, except from having nonactual members of the subject property (e.g. in *Thick paperback books contain an odd number of typos* we expect the universal statement to hold in w_0 and in all worlds which are overall similar to it, except from what is needed to allow for the presence of nonactual thick paperback books).

We can see, then, that the degree of vagueness concerning the characterization of the legitimate exceptions to a generic, correlates with the degree of vagueness concerning the characterization of the possible worlds quantified over, i.e. with the degree of vagueness of the accessibility relation. This correlation is schematically summarized in (53):

(53)

	Degree of vagueness of the accessibility relation	Degree of vagueness with respect to properties of the exceptions
Unambiguously 'in virtue of' generics	**Low**	**Low**
Unambiguously 'descriptive' generics	**High**	**High**
	⇓	⇓
	Degree of vagueness of $\forall w$	⇒ Degree of vagueness of $\forall x$

Now the idea is that instead of having two independent types of vagueness – one in the restriction on $\forall w$, and one on the restriction on $\forall x$ – we should find a way to derive the latter type of vagueness from the former. One way to do that is to try and capture the strong vagueness of Lewis's overall similarity, and the weaker vagueness of the 'in virtue of' accessibility relation using a supervaluationist treatment, and then define a uniform algorithm deriving the properties in restriction on $\forall x$ from the accessibility relation restricting $\forall w'$. In this way we may be able to reach a state where the difference in domain vagueness of IS and descriptive BP sentences follows naturally from the difference in accessibility relation (i.e. from the type of nonaccidental generalization expressed), with no need of stipulation.

Finally, the interaction between context dependence and vagueness in natural language generics is another direction which should be studied in more depth. An interesting manifestation of this interaction is illustrated in section 5 above, with IS sentences like *An accountant in this place hardly pays taxes*. We saw that in such 'out of the blue' utterances we have a high degree of vagueness concerning the properties of the exceptions, but contextual support limits this vagueness by providing a salient accommodated 'in virtue of' property, which indirectly limits

the type of properties in the vague restriction of the generic quantifiers. This phenomenon seems similar to the interaction of context dependence and vagueness in multidimensional vague predicates like *clever*, where contextual support first helps chose one dimension of cleverness ('clever in which sense?') which the listener should accommodate, and by that reduces the vagueness of this predicate, although does not completely eliminate it. Kamp's (1975) discussion of the types of models suitable to capture this phenomenon can be a starting point for capturing the context-vagueness interaction with generics. Another promising direction is Kyburg and Morreau's (2000) as well as Barker's (2002) dynamic treatments of the interaction of accommodation and vagueness resolution with vague predicates, in cases where shifts in the common ground occur.

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CONTEXT AND QUANTIFICATION

BINDING SYMMETRIES AND NOMINAL DUALITIES

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1 Introduction

The grammatical constraints on anaphoric binding, known as binding principles, have been observed to form a classical square of logical oppositions. In this paper, we argue that this is the sign of the quantificational nature of binding constraints. More specifically, we show that these constraints are the effect of phase quantifiers over reference markers in grammatical obliqueness hierarchies.

We also discuss the impact of this result on our understanding of the semantics of nominals and, in particular, on the distinction between quantificational and referential nominals.

1.1 Anaphoric binding constraints

Since the so called integrative approach to anaphora resolution was set up in late eighties (Carbonell & Brown 1988; Rich & Luperfoy 1988; Asher & Wada 1988) and its practical viability extensively checked out (Lappin & Leass 1994; Mitkov 1997), it is common wisdom that factors determining the antecedents of anaphors divide into filters and preferences. The latter help to pick the most likely candidate, that will be proposed as the antecedent; the former exclude impossible antecedents and help to circumscribe the set of antecedent candidates.

Binding principles are a significant subset of such filters. They capture generalisations concerning the constraints on the relative positioning of anaphors with respect to their admissible antecedents in the grammatical geometry of sentences. From an empirical perspective, these constraints stem from what appear as quite cogent generalisations and exhibit a universal character, given the hypothesis of their parameterised validity across natural languages. From a conceptual point of view, in turn, the relations among the definitions of binding constraints involve non-trivial cross symmetry, which lends them a modular nature and provides further strength to the plausibility of their universal character. Binding principles have thus been considered one of the most significant modules of grammatical knowledge, usually termed as "binding theory" in generative linguistics.

We follow here the definition of these generalizations as it is proposed in Pollard & Sag (1994), and subsequent extension in Xue et al. (1994); Branco & Marrafa (1999), which is presented below, together with some examples. These constraints on the anaphoric capacity of nominals induce a partition of the set of anaphors into four classes. According to this partition,

every anaphor is of one of the following anaphoric types: short-distance reflexive, long-distance reflexive, pronoun, and non-pronoun.

(1) **Principle A:** A locally o-commanded short-distance reflexive must be locally o-bound.

[Lee$_i$'s friend]$_j$ thinks [[Max$_k$'s neighbour]$_l$ likes himself$_{*i/*j/*k/l}$].

Principle Z: An o-commanded long-distance reflexive must be o-bound.

[*O amigo do Lee$_i$*]$_j$ *acha* [*que* [*o vizinho do Max$_k$*]$_l$ *gosta*
the friend of_the Lee thinks that the neighbour of_the Max likes
dele próprio$_{*i/j/*k/l}$].(*Portuguese*)
of_him self
'[Lee$_i$'s friend]$_j$ thinks [[Max$_k$'s neighbour]$_l$ likes him$_{*i/j/*k/}$/ himself$_l$]'

Principle B: A pronoun must be locally o-free.

[Lee$_i$'s friend]$_j$ thinks [[Max$_k$'s neighbour]$_l$ likes him$_{i/j/k/*l}$].

Principle C: A non-pronoun must be o-free.

[Lee$_i$'s friend]$_j$ thinks [[Max$_k$'s neighbour]$_l$ likes the boy$_{i/*j/k/*l}$].

The empirical generalizations above are captured with the help of a few auxiliary notions. The notion of *o-binding* is such that x o-binds y iff x o-commands y and x and y are coindexed, where coindexing is meant to represent anaphoric links.[1]

O-command is a partial order under which, in a clause, the Subject o-commands the Direct Object, the Direct Object o-commands the Indirect Object, and so on, following the usual obliqueness hierarchy of grammatical functions; in a multiclausal sentence, the upward arguments o-command the successively embedded arguments.[2]

The notion of *local domain* for an anaphoric nominal n concerns the partition of sentences and associated grammatical geometry into two zones of greater or less proximity with respect to n. Typically, the local domain of n coincides with the selectional domain of the predicator subcategorising n. In some cases, there may be additional requirements that the local domain is circumscribed by the first upward predicator that happens to be finite, bears tense or indicative features, etc.[3]

[1] There are anaphors that appear as Subject-oriented, in the sense that they only take antecedents that have the grammatical function Subject. Some authors (e.g. Dalrymple 1993) assume that this should be seen as an intrinsic parameter of binding constraints and aim at integrating it into their definition. In this point, we follow previous results of ours reported in Branco (1996), where the apparent Subject-orientedness of anaphors is argued to be, not an intrinsic feature of binding constraints, but one of the surfacing effects resulting from the non linear obliqueness hierarchy associated with some predicators (or with all of them in some languages).

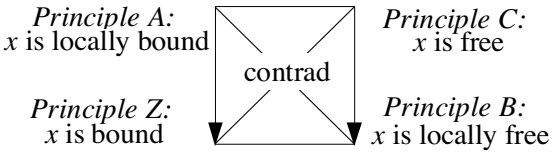
[2] The o-command relation is defined on the basis of obliqueness hierarchies successively embedded along the relation of subcategorization: "Y o-commands Z just in case either Y is less oblique than Z; or Y o-commands some X that subcategorizes for Z; or Y o-commands some X that is a projection of Z" (Pollard & Sag 1994:279). For a discussion of the empirical justification for obliqueness hierarchies as well as references on this topic, see Pollard & Sag (1987:Sec.5.2).

[3] See Dalrymple (1993) for details and examples.

1.2 Binding square of oppositions

With these introductory remarks on anaphoric binding constraints in place, the key observation to make with respect to the generalisations in (1) above is that, when stripped away from procedural phrasing and non-exemption requirements,[4] they instantiate the following square of oppositions (Branco & Marrafa 1999):

(2)



There are two pairs of *contradictory* constraints, which are formed by the two diagonals, (A, B) and (C, Z). One pair of *contrary* constraints (they can be both false but cannot be both true) is given by the upper horizontal edge (A, C). One pair of *compatible* constraints (they can be both true but cannot be both false) is given by the lower horizontal edge (Z, B). Finally two pairs of *subcontrary* constraints (the first coordinate implies the second, but not vice-versa) are obtained by the vertical edges, (A, Z) and (C, B).

Given this new square of oppositions, the natural question to ask is whether this is a sign that binding principles are the visible effect of some underlying quantificational structure. A major point of this paper is to argue that this question can be answered affirmatively.

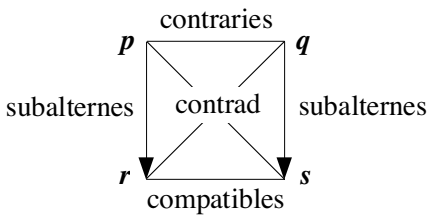
2 Quantification

2.1 Duality

Löbner (1987) suggested that the emergence of a notoriously non trivial square of logical duality between the semantic values of natural language expressions is a major empirical touchstone to ascertain their quantificational nature; and van Benthem (1991), while noting that the ubiquity of the square of duality may be the sign of a semantic invariant possibly rooted in some cognitive universal, highlighted its heuristic value for research on quantification inasmuch as "it suggests a systematic point of view from which to search for comparative facts" (p.23).

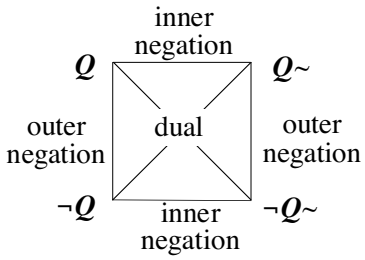
Given the working question raised above in the previous section, it is of note that a square of duality, in (4), is different and logically independent from a classical square of oppositions, in (3):

(3)



[4]Detailed discussion of exemption occurrences of reflexives is presented in footnote 7.

(4)



The difference lies in the fact that duality, inner negation and outer negation are third order concepts, while compatibility, contrariness and implication are second order concepts. As a consequence, it is possible to find instantiations of the square of oppositions without a corresponding square of duality, and vice-versa. [5]

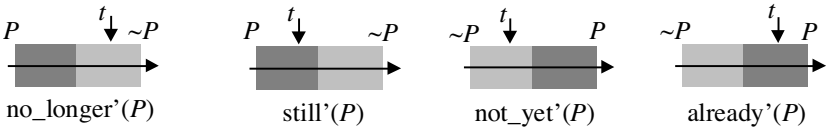
Although the two squares are logically independent, the empirical emergence of a square of oppositions for the semantic values of natural language expressions – like the one in (2) above – naturally raises the question about the possible existence of an associated square of duality, and about their quantificational nature.

In view of arguing towards the main point of this paper, we thus proceed by showing that there is a square of duality associated with the grammatical constraints on anaphoric binding.

2.2 Phase quantification

Before this result can be fully worked out, some analytical tools are to be introduced first. We resort to the notion of phase quantification, introduced in Löbner (1987) to study the semantics of aspectual adverbials and shown to be extended to characterise quantification in general. For the sake of concreteness, consider a diagrammatic display of the semantics of aspectual adverbials:

(5)

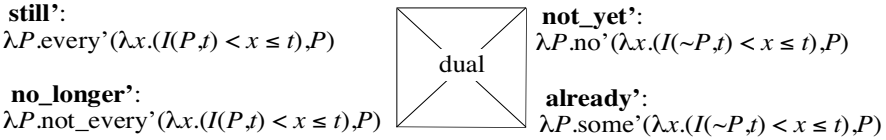


Very briefly, phase quantification requires the following ingredients: (i) an order over the domain of quantification; (ii) a parameter point t; (iii) a property P defining a positive semiphase in a sequence of two opposite semiphases; and (iv) the starting point of a given semiphase.

For the analysis of aspectual adverbials in terms of phase quantification, the order of (i) is the time axis; the parameter point t of (ii) is the reference time of the utterance; the relevant property P of (iii) denotes the instants where the proposition modified by the adverbial holds (with the adverbials *no longer* and *still* bearing the presupposition that semiphase P precedes semiphase $\sim P$, and *not yet* and *already* bearing the presupposition that $\sim P$ precedes P); and the starting point in (iv) is $I(R,t)$, the infimum of the set of the closest predecessors of t which form an uninterrupted sequence in phase R. [6]

Given these correspondences, the aspectual adverbials can be analysed as expressing the following quantifiers:

(6)



[5] See Löbner (1987) for examples and discussion.

[6] See Löbner (1987, 1989) for a thorough definition.

3 Quantificational binding constraints

With this in place, the empirical generalisations captured in the definition of binding principles in (3) can be argued to be the visible effect of the phase quantificational nature of the corresponding nominals. In the present section, we will show how anaphoric nominals can be analysed as expressing one of four quantifiers acting on the domain of reference markers arranged in terms of the grammatical obliqueness order of their clauses.

3.1 Phase quantification ingredients

Phase quantification here is assumed to unfold not over entities of the extra-linguistic universe, but over entities in the universe of grammatical representations, vz. reference markers (Karttunen 1976; Kamp 1981; Heim 1982; Seuren 1985). Its ingredients are set up as follows:

(i) *Order:* reference markers are ordered according to the o-command relation;

(ii) *Parameter point:* t is set up as a, the reference marker of the antecedent of the anaphoric nominal at stake;

(iii) *Phase property:* P is set up as D, denoting the set of markers in what we term here the binding domain of the anaphor.

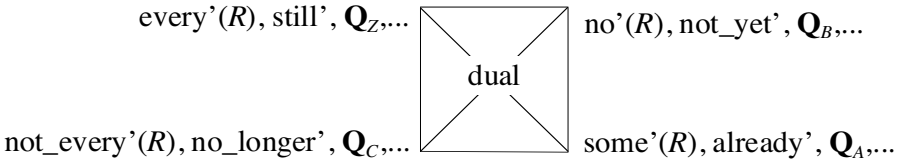
In terms of phase quantification, the binding domain is thus the positive semiphase in the sequence of two opposite semiphases. This positive semiphase D for binding is defined as follows: For an anaphoric nominal n (e.g. *himself*) in a given sentence s (e.g. *Kim said that Lee described Max to himself*), D is determined by the position of n in the obliqueness order which n enters in s (i.e. given the example above, that order is *Kim* $<$ *Lee* $<$ *Max* $<$ *himself*). Given r, the reference marker of n, semiphase D_r is a stretch containing r and the markers that are less than or equal to r in the obliqueness order such that the closest D_r neighbour of semiphase $\sim D_r$ is local with respect to r (i.e. given the example above, $k < l < m < r$, with $\sim D_r$: $k < l$ and D_r: $m < r$, where m is here the closest neighbour of $\sim D_r$ which is local with respect to r).

It is of note that the positive phase/binding domain D is not necessarily the local domain of the corresponding anaphor. In case $\sim D_r$ is presupposed to precede D_r, the first predecessor in D_r is local with respect to r. In this case, D_r contains in fact the local o-commanders of r (as in the example sentence in the paragraph above) thus becoming close to the notion of local domain.

But in the other case, that is in the case where semiphase D_r is presupposed to precede $\sim D_r$ (e.g. for long-distance reflexives – cf. discussion and examples in the Subsections below), D_r may not coincide with the local domain of r. Given the sequence $D_r.\sim D_r$ now, D_r is such that the last successor in it (r itself) is local with respect to r. Therefore, D_r contains all o-commanders of r, including those that are local and, in case they exist, also those that are not local with respect to r.

Given these ingredients for phase quantification and the appropriate replacements in the square in (6), one gets four phase quantifiers – we termed $\mathbf{Q}_Z$, $\mathbf{Q}_B$, $\mathbf{Q}_C$ and $\mathbf{Q}_A$ – entering the square of duality and aligning with other quantifiers of similar quantificational force at each of the corners:

(7)



As we are going to check in the Subsections below, these four phase quantifiers ensure the same empirical predictions as secured by the four binding constraints stated in (1).

3.2 Short-distance reflexives

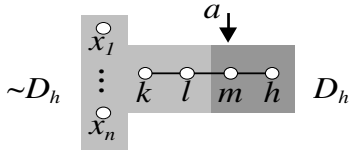
The quantifier expressed by short-distance reflexives is associated with the presupposition that $\sim D.D$. It receives the following definition:

$\mathbf{Q}_A$: λP.some'$(\lambda x.(I(\sim P, a) < x \leq a), P)$

This is easily interpreted against the diagram corresponding to an example sentence like

Kim said Lee thinks $[$*Max*$_i$ *hit himself*$_i]$.

In the diagram below, k, l, m and h stand, respectively, for the reference markers of *Kim*, *Lee*, *Max* and *himself*; and $x_1, \ldots, x_n$ stand for the markers not in the obliqueness relation of *h*, including those possibly introduced in other sentences of the discourse or available in the context (Hasse diagrams are displayed with a turn of 90 degrees right):



$\mathbf{Q}_A(D_h)$ is satisfied iff between the bottom of the uninterrupted sequence $\sim D_h$ most close to the admissible antecedent a and a inclusive, there is at least one reference marker in D_h. As $\sim D_h$ precedes D_h, this amounts to requiring that an admissible antecedent a be in D_h, the local domain of the short-distance reflexive marker h, and consequently that a be a local o-commander of h – in the example sentence above, this implies that only *Max* can be an admissible antecedent of *himself*, which matches the requirement of Principle A in (1).

Binding phase quantifier $\mathbf{Q}_A$ is thus analysed as having positive existential force and short-distance reflexives align in the square of duality in (7) with items like *some N*, *already*, *possibly*, etc.

3.3 Pronouns

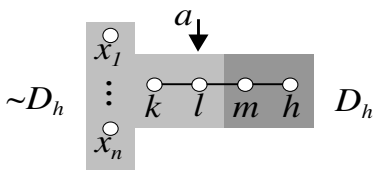
The phase quantifier expressed by pronouns, in turn, is analysed as lying at the same corner as the quantifiers no'(R) or not_yet' in (7):

$\mathbf{Q}_B$: λP.no'$(\lambda x.(I(\sim P, a) < x \leq a), P)$

For the sake of the discussion, let us consider a prototypical working example like the sentence:

Kim said Lee$_i$ thinks [*Max hit him$_i$*],

The presupposition conveyed by these anaphors is also that $\sim D.D$, and $\mathbf{Q}_B$ is easily grasped when considering the diagrammatic description where h is the reference marker of *him*:



$\mathbf{Q}_B(D_h)$ is satisfied iff no reference marker between the bottom of $\sim D_h$ and the admissible antecedent a inclusive is in D_h, which implies that a is in $\sim D_h$. Henceforth, according to this analysis, admissible antecedents of a pronoun have to be outside the local domain of the pronoun (in the example above, *Max* is ruled out as an admissible antecedent of *him*), thus matching the generalisation captured by Principle B.

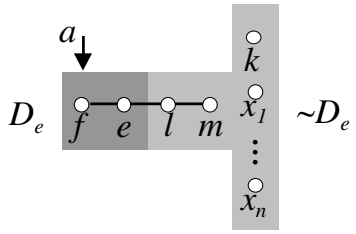
It is of note that, in the working example above, $\sim D_h$ includes not only the markers k and l of *Kim* and *Lee*, in the upwards clause, but also $x_1, \ldots, x_n$ thus allowing for non-sentential anaphoric links for the pronoun (including those that are discourse- or context-driven, deictic, etc.).

3.4 Long-distance reflexives

Turning to long-distance reflexives, we consider the following working example from Portuguese:

[*O amigo de Kim*]$_i$ *disse que ele próprio$_i$ acha* [*que Lee viu Max*](*Portuguese*)
[the friend of Kim]$_i$ said that ele próprio$_i$ thinks [that Lee saw Max].
'[*Kim's friend*]$_i$ *said "ele próprio"$_i$ thinks* [Lee saw Max].'

Its diagram can be displayed as follows, where e is the marker of the long-distance reflexive:



The phase quantifier expressed by long-distance reflexives is analysed as having positive universal force and can be found at the same corner of the square in (7) as the quantifiers every'(R) or still':

$\mathbf{Q}_Z$: λP.every'$(\lambda x.(I(P,a) < x \leq a), P)$

As with short-distance reflexives, an admissible antecedent a is here required to occur in D_e though the presupposition conveyed now is that the positive semiphase D is followed by the negative semiphase $\sim D$. Taking into account the definition of positive phase D in Section 3.1,

the antecedent a is thus required to be an o-commander – local or not – of the marker e of the anaphoric nominal.

The semantics of the phase quantifier corresponding to long-distance reflexives is such that, for $\mathbf{Q}_Z(D_e)$ to be satisfied, between the bottom of the uninterrupted sequence D_e closest to an admissible antecedent a and a inclusive, every reference marker is in D_e.

In terms of the working example above, this amounts to requiring that only *Kim's friend* can be taken as an admissible antecedent of the long-distance reflexive *ele próprio*. In general terms, this amounts to requiring the admissible antecedent a to be in D_e, i.e. to imposing that any admissible antecedent is an o-commander of the long-distance reflexive, as required in Principle Z.[7]

3.5 Non-pronouns

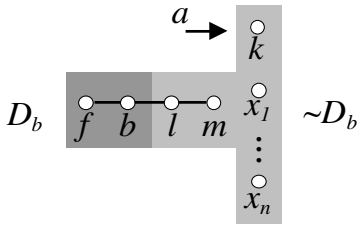
Non-pronouns are analysed as expressing a quantifier that appears at the same corner of the square in (7) as quantifiers like not_every'(R), no_longer', etc.:

$\mathbf{Q}_C$: $\lambda P.$not_every'$(\lambda x.(I(P,a) < x \leq a), P)$

In order to support the justification of this analysis with a discussion of a prototypcal working example, we take the following sentence:

[*Kim$_i$'s friend*] *said the boy$_i$ thinks* [*Lee saw Max*].

Let us consider a first version of the diagram for this example, where b is the marker corresponding to *the boy*:



[7] When reflexives occur in a syntactic position where they have no possible antecedent o-commanding them in their binding domain, their anaphoric capacity is exempt from the usual binding "discipline" and they present a so-called logophoric behaviour. This is illustrated in the following example from Golde (1999:73), where *herself* picks an antecedent outside its (local) binding domain, the NP *the portrait of herself*: *Mary$_i$ thought the artist had done a bad job, and was sorry that her parents came all the way to Columbus just to see* [*the portrait of herself$_i$*].

Under the quantificational analysis of binding constraints we are presenting, to a reflexive m in an exempt position (i.e. in the bottom of the positive semiphase D), there corresponds the maximum "shrink" of D, as this is the singleton whose sole element is m. This maximum shrink has a disturbing impact only in the phase quantifiers for which the antecedent a is to be found in D, namely $\mathbf{Q}_A$ and $\mathbf{Q}_Z$. In these cases, for a to be in D and the relevant phase quantification to be satisfied, a can only be identified with m itself.

As m happens to be engaged in this anaphoric anchoring loop, its non vacuous interpretation remains to be accomplished. Admittedly, an overarching interpretability requirement is in force in natural languages ensuring the "meaningful" anchoring of anaphors: For an exempt reflexive to be non vacuously interpreted, an antecedent – inevitably one outside the binding domain of the reflexive in such cases – has to be fixed. Logophoricity appears thus as an exceptional anaphoric behaviour of reflexives that shows up when their interpretation has to be untied from anchoring loops formed by virtue of their markers occurring in the bottom of the positive semiphase D.

The presupposition here is that the positive semiphase precedes the negative semiphase. Furthermore, an admissible antecedent a of b should be required to occur in $\sim D_b$, which implies that a cannot be an o-commander of b, thus rendering the same constraint as expressed in Principle C.

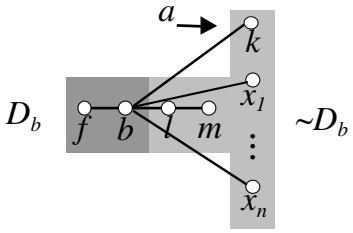
In terms of our example sentence, this means that *Kim's friend* is ruled out as an admissible antecedent of *the boy* by the non satisfaction of the phase quantifier exressed by *the boy*. The anaphoric links between *the boy* and *Lee* or *Mark*, in turn, are not ruled out by (the possible non satisfaction of) the quantifier expressed by *the boy*, but by the non satisfaction of the quantifiers that are expressed by *Lee* and *Mark*, respectively.

As in previous diagrams, the negative semiphase $\sim D$ is taken here as the complement set of the positive semiphase D. Fully correct empirical prediction requires however this assumption to be refined and a more accurate definition of $\sim D$ be provided for phase quantification in non-linear orders – as the one under consideration – where not all elements of the quantification domain are comparable.

Note that for $\mathbf{Q}_C(D_b)$ to be satisfied, between the bottom of D_b and the antecedent a inclusive, not every reference marker is in D_b. In examples as the one above, the denotation of $\lambda x.(I(D_b, a) < x \leq a)$, the restrictor of $\mathbf{Q}_C$, is always empty: It is not the case that $I(D_b, a) \leq a$ because when $a = k$ (or $a = x_i$, for any i), a is not comparable to any element of D_b, including its bottom, $I(D_b, a)$. Hence, not_every'$(\lambda x.(I(D_b, a) < x \leq a), D_b)$ is false whatever reference marker, k or x_i, happens to be taken as the antecedent for b. As a consequence, the specific anaphor resolution in the example above would be incorrectly ruled out.

This suggests that when phase quantification operates on non-linear orders, negation of the positive phase P may be slightly more sophisticated than simple Boolean negation rendering its complement set. We are taught that negation of P also involves the lifting of the complement set, $\overline{P}_{\perp}$, with $\perp$ equal to the top of P (b in the working example above) when there is the presupposition that P. $\sim P$.[8]

With this fine-tuned definition of the negative semiphase, the diagrammatic display for our working example becomes:



This specification of the negative semiphase correctly ensures that $\mathbf{Q}_C(D)$ is satisfied iff not every marker between the antecedent a and the bottom of D_b is in D_b; that is, iff a is not in D_b and, therefore, is not an o-commander of b, as stated in Principle C.

4 Discussion

The results reported in this paper may shed new light over a number of research issues, to whose discussion we turn now.

[8]For the sake of formal uniformity, when there is the presupposition that $\sim P.P$, the order-theoretic dual of this definition for $\sim P$ can also be assumed.

4.1 Binding symmetries

The intriguing symmetries between the definitions of binding constraints have been a source of puzzlement and challenge in the last decades for the research on nominal anaphora. These symmetries fostered the view that grammatical binding constraints belong to a coherent set or, as many have called it, to a binding "theory". They have inspired a number of accounts that try to justify them in terms of – and sometimes try to take them as the justification for – some underlying or general cognitive, functional, pragmatic, "economy"-driven, etc. foundations of language use or of the language faculty (see a.o. Levinson 1991; van Hoeck 1997; Reuland 2001; Piñango 2001).

The analysis presented in this paper provides for a notoriously elegant way of relating the different binding constraints with each other in a compact "theory". While presenting a formally precise account of the relations among binding constraints, this analysis offers a straightforward justification for the "symmetries" among them: the latter are the kind of "symmetries" that hold among the corners of squares of duality.

4.2 Natural language quantification

Many authors have stressed the view that there is no correspondence between surface and logical form of quantificational expressions of natural languages. Löbner emphasised this non-correspondence by pointing out that, while domain restrictor and quantified predicate are rendered by two different surface expressions in nominal quantification, in phase quantification expressed by aspectual adverbials, only the quantified predicate is available at the surface form.

With phase quantification expressed by anaphors, this gulf between surface and logical form widened further: There is no surface expression directly rendering either the domain restrictor of quantification or the quantified predicate.

Other important implications for our understanding of quantification in natural languages might have been uncovered as well by the results presented above. Quantification is extended to universes whose elements are not entities of the "extra-grammatical" universe, but entities of the "intra-grammatical" world itself: The models against which binding phase quantification is to be interpreted are not representations of the world, with everyday entities like donkeys, farmers, etc., but grammatical representations, with entities like reference markers, grammatical functions, etc. Hence, satisfaction of a formula made out of a binding phase quantifier, $\mathbf{Q}_A$, $\mathbf{Q}_Z$, $\mathbf{Q}_B$ or $\mathbf{Q}_C$, turns out to be a well-formedness constraint on the sentence where the corresponding anaphor occurs: For the meaning of "classic" quantification to be determined, one has to know how the world has to be for it to be true; for the meaning of binding phase quantification to be determined, one has to know how the corresponding grammatical representation has to be for it to be true.

4.3 Nominal dualities

It is also worth considering the implications of the results reported here for the overall semantic make up of nominals.

The shared wisdom is that nominals convey either quantificational or referential force, and a large bulk of the research on the semantics of nominals has been concerned with determining which side of this divide definite descriptions belong to (cf. a.o. Neale 1993; Larson & Segal

1995). For the sake of the argument, let us assume that definites are referential terms. Let us also take into account that proper names are ruled by binding Principle C.

Given these assumptions, the analysis developed in this paper implies that nominals with "primary" referential force (*he*, *the book*, *John*,...) have a certain "secondary" quantificational force: They express quantificational requirements – over reference markers in grammatical representations –, but cannot be used to directly quantify over extra-linguistic world entities, like the other "primarily" quantificational nominals (*every man*, *most students*,...) do.

This duality of semantic behaviour, however, turns out not to be that much surprising if one observes a symmetric duality with regards to quantificational nominals, apparent when they act as antecedents in e-type anaphora, as in the example *Most students$_i$ came to the party and they$_i$ had a wonderful time*. The analysis of e-type anaphora envisaged by some authors (e.g. Kamp & Reyle 1993:4.1.2) implies that nominals with "primary" quantificational force have a certain "secondary" referential force: These nominals have enough referential strength to evoke and introduce reference markers in the grammatical representation that can be picked as antecedents by anaphors – and thus support the referential force of the latter – but they cannot be used to directly refer to extra-linguistic entities, like the other "primarily" referential terms do.

If the results reported here are meaningful, the duality quantificational vs. referential nominals is less strict but more articulated than it has been assumed. Possibly taking indefinite descriptions aside, every nominal makes a contribution in both semantic dimensions of quantification and reference, but with respect to different universes. "Primarily" referential nominals have a dual semantic nature – they are "primarily" referential and "secondarily" quantificational – that is symmetric of the dual semantic nature of "primarily" quantificational ones – they are "primarily" quantificational and "secondarily" referential.

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SUPERLATIVE QUANTIFIERS AND THE DYNAMICS OF CONTEXT DEPENDENCE

Javier Gutiérrez-Rexach, Ohio State University, USA

1 The two readings of superlative quantifiers

Ross (1964) and Szabolcsi (1986) noticed that superlatives are ambiguous in general. This ambiguity can be observed cross-linguistically, in languages as diverse as Hungarian, German, English, or the Romance languages in general. Consider sentence (1):

(1) John climbed the highest mountain.

The two readings of sentence (1), which are a by-product of the two interpretations of the superlative description *the highest mountain*, are respectively labeled the *absolute* and the *comparative* reading by Szabolcsi. The intended paraphrases of the absolute reading is 'John climbed a mountain higher than any other mountain', where the superlative description refers to the highest mountain under consideration, for instance Mount Everest. The comparative reading can be paraphrased as 'John climbed a mountain higher than the mountains anybody else climbed'. Obviously, in this case it is not necessary that John climbed the highest mountain (Mount Everest). For the sentence to be true it suffices that the mountain John climbed is the highest among those climbed by all individuals being compared. It is also a common observation in the literature on this subject that focus affects condition the emergence of comparative readings. For example, sentence (2) has one absolute reading but may have more than one comparative reading:

(2) John bought Lisa the most expensive present.

The absolute reading of this sentence is 'John bought Lisa a present more expensive than any other present', for example, a diamond. The differential source for the two comparative readings is the focused constituent, either *John* or *Lisa*. More specifically, (2) has the following comparative readings – where for any expression α, $[\ \alpha\ ]_F$ indicates that α is in focus:[1]

[1]A related issue of interest is to determine whether prosodic focus is needed in order to trigger a comparative reading. Szabolcsi (1986) notes that this does not seem to be the case. In other words, although the focal prominence of a constituent facilitates the comparative reading, the absence of intonational focus marking on a given constituent does not entail that the sentence only has the absolute reading obligatorily and lacks a comparative reading based on that constituent. Conversely, as pointed out by an anonymous reviewer, the presence of focus does not force the comparative reading either. For example, if somebody asks *Who climbed the highest mountain?* and I answer $[\ John\ ]_F$, this sentence still has an absolute reading.

[John]$_F$ bought Lisa the most expensive present. →
'John bought Lisa a present more expensive than the presents that anybody else bought Lisa.'
John bought [Lisa]$_F$ the most expensive present. →
'John bought Lisa a present more expensive than the presents that he bought anybody else.'

In this paper, these data will be viewed as critical empirical evidence to defend the idea that there is no ambiguity in the interpretation of superlatives. The two readings will be argued to be a result of the context-dependent nature of superlative definite descriptions and the interplay with other related factors (mainly their syntactic representation and the interpretation of focus). Certain aspects of this hypothesis are not new, since it has been assumed or explicitly defended by several past and current proposals under different guises – cf. two recent incarnations represented by Farkas & Kiss (2000) or Sharvit & Stateva (2002). The novelty of the present treatment resides in the fact that an explicit account of the dynamics of superlative descriptions is presented for the first time. This dynamic treatment emphasizes the importance of a detailed explanation of the presuppositional structure of superlatives. Assumptions about the compositional semantics of superlatives clearly become non-trivial, since the composing elements are responsible for triggering several presuppositions of a different nature.

The adopted grammatical architecture can be called a "hybrid" model of grammar with two levels of representation: Logical Form (LF) and Discourse Representation Structure (DRS). Ignoring the phonological component, such a model associates representations at both levels with a well-formed (sentential) expression, i.e. each sentence has a unique LF and DRS. These levels are not completely separated. It is a common assumption that there is a derivational relation between them. For example, Kamp & Reyle (1993) propose that DRS-construction rules operate on syntactic-analysis trees and not on unlabeled terms. Szabolcsi (1997) argues in favor of a system of LF-representation that serves directly as input to the DRS-construction algorithm. In the LF component of this system, several functional projections host constituents and check their encoded features as a function of the type of discourse referent that they respectively contribute to a DRS representation. In general, the main assumption behind such a system is that interface constraints are expressed in one of the two levels depending on their intrinsic nature. Those constraints belonging to the syntax/semantics interface are captured by restrictions on LF representations. In turn, semantic/pragmatic constraints properly belong to discourse representations (DRSs).[2]

The paper is structured as follows: in section two, a first approximation to the semantics of superlatives is presented, in which they are treated as a subclass of definite Determiner Phrases (DPs); in section three, it is explored how contextual factors affect the interpretation of superlatives; after establishing a distinction between the context set of a definite and the frame of comparison in section four, a theory of how focus determines the comparative readings is developed in section five. Finally, in sections six and seven, further evidence is introduced for the advocated analysis, taking into account data from interrogative and existential constructions.

[2]This view of the grammatical architecture is compatible with the minimalist view of grammar advocated by Chomsky (1995) and his followers. Within minimalist assumptions, the level of LF is the only level of grammatical representation and serves as input to the conceptual/intentional system (the nature and articulation of this system is left unexplained unfortunately). Obviously, some if not most of the ideas proposed here may be implemented within alternative conceptions of the grammatical architecture, such as those advocated within HPSG, where semantic and contextual properties are represented as features of a linguistic sign.

2 The semantics of superlatives

Starting with Szabolcsi's treatment, the most common trend in the literature on the topic has been to offer a non-compositional view of superlatives, which have been treated as 'hidden' indefinites. The present proposal will be departing from this received view and will defend a straightforward compositional semantics of superlatives. In principle, the most straightforward starting point to determine the semantic content of a superlative description of the form 'the X-*est* Y' is to decompose it in two separate elements: the definite determiner (*the*) and a superlative operator (*-est*). A relatively standard, although not completely uncontroversial, semantics of definites, as proposed in Generalized Quantifier Theory (Keenan & Westerståhl 1997), will also be assumed. Definite determiners, like demonstrative and interrogative determiners, denote inherently restricted functions. Consider the following sentences:

(3) a. Two men are waiting at the exit door. The tall one is a secret agent.

b. Two men are waiting at the exit door. This one is a secret agent.

c. Two men are waiting at the exit door. Which one is a secret agent?

The above examples illustrate a very elementary instance of the importance of context-dependent enrichment in determining the domain restriction of certain generalized quantifiers. The quantificational domain of the determiners at the beginning of the second sentences in the above discourses is critically related to the preceding discourse fragment. In (3a), the domain of quantification for the definite description *the tall one* is restricted to a two-membered set of men waiting at the exit door. Similarly, in (3b,c) the preceding discourse determines the set restricting the interpretation of the demonstrative quantifier and the interrogative quantifier. In generalized quantifier theory, contextual effects on domain restriction are viewed as the result of the presence of a relativization parameter on determiner functions. In general, it is assumed that certain determiners are restricted by *context sets*, as proposed by Westerståhl (1985, 1989).[3] For E a universe of individuals, **D** a determiner function over E, and $A, B, C \subseteq E$, we say that $\mathbf{D}^C$ is the restriction of **D** to C iff $\mathbf{D}^C(A)(B) \Leftrightarrow \mathbf{D}(A \cap C)(B)$. The variable C represents the context set of the determiner function and restricts its first argument The function denoted by the determiner *the* would be (4).

(4) $\mathbf{the_{sg}} =_{df} \lambda C.\lambda A.\lambda B.\forall x[A(x) \wedge C(x) \rightarrow B(x)] \wedge Card(\lambda x.A(x) \wedge C(x)) = 1$
$= \lambda C.\lambda A.\lambda B.\iota x \in C[A(x) \wedge B(x)]$

Similar views on this context-dependence property of definite determiners and quantifiers can be found in Stanley & Williamson (1995), Stanley (2000, 2002), and Stanley & Szabo (2000) among others. For example, the latter defend the claim that quantificational domains are restricted by a hidden indexical. Alternatively it might be argued that there is an abstract constituent subject to syntactic or pragmatic ellipsis. Westerståhl's view on definites can be extended to the analysis of pronominal anaphors and cataphors, as has been argued in Gutiérrez-Rexach (1999, 2003).

[3]The use of the term 'context set' by Westerståhl should not be confused with Stalnaker's (1978) use of the same term. For Stalnaker the context set of a conversation at time t is the set of worlds that are compatible with all the propositions that are presupposed in the conversation at t. Interestingly, as the reader will be able to verify in the course of this paper, adding context sets à-la Westerståhl to discourse representations encoding presuppositional structure yields a view of context sets that is closely related to Stalnaker's view.

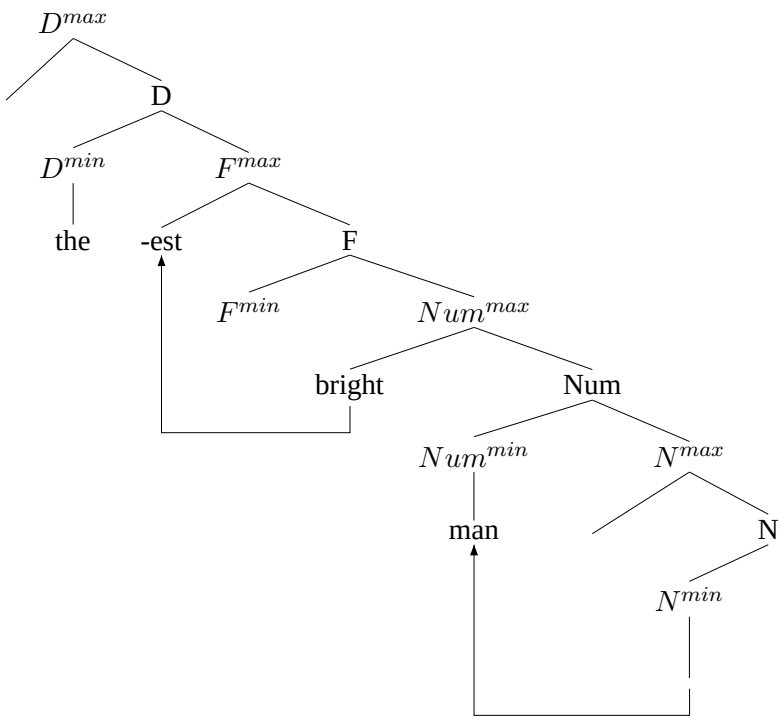
Nevertheless, there are several apparent problems in using context sets as a semantic parameter, which have led other researchers to propose a uniform context-insensitive semantics for quantifiers. Among the most recent representatives of this view, Lepore (2003), Cappelen & Lepore (2002), and Lepore & Cappelen (2003) have critiziced the context-sensitive semantics on the basis of what they call the indeterminacy problem. In a nutshell, for these authors enriching logical representations with contextual parameters, which represent either sets or indexicals, normally leads to multiple potential completions and ultimately to semantic underdetermination.[4] Nevertheless, most if not all criticisms of the context-sensitivity view assume a static view of meaning. If one adopts a dynamic view of sentence meaning, the problem of semantic indeterminacy weakens considerably. At a discourse state s, given a context-sensitive description δ restricted to a context set C, the value of C for δ will be uniquely determined by the discourse preconditions that are satisfied and operative at s. Several dynamic and/or discourse dependent views of domain restriction have been proposed in the past decade by von Fintel (1994); Roberts (1995); Groenendijk et al. (1995), and Geurts & van der Sandt (1999) among others. Combining a dynamic view of semantic interpretation with the context-set approach requires viewing context sets as entities "in flux" that are introduced, altered and possibly eliminated from the common ground as the conversation progresses. Furthermore, they are subject to presuppositional restrictions, as the relevant discourse presuppositions are accommodated as needed. In the same vein, Zeevat (1999) defends the idea that contextual restrictions on indexicals and pronouns are introduced, by presupposition accommodation, as conditions on the discourse referents in a Discourse Representation Structure (DRS). Similar views on the presuppositional restrictions that are satisfied by demonstratives are advocated by Roberts (2002) and Gutiérrez-Rexach (2002). For example, the demonstrative quantifier *this one*, which is defined below, is restricted to a context set C, which in turn has to satisfy a set of presuppositions.

(5) **this one** $=_{df}$ $\lambda C.\lambda B.\forall x[C(x) \rightarrow B(x)]\&Card(\lambda x.C(x))$ = 1
Presuppositions: { Demonstrated$_{utt}$(C) & Proximal$_{utt}$(C) & Unique(C) & Weakly Familiar (C) &, etc. }

The main goal of sections 3 and 4 will be to spell-out in detail the presuppositions that operate on the context sets restricting a superlative definite description. Let us turn now to the second ingredient in the composition of the superlative: the contribution of the superlative operator. For the purposes of this paper, a standard generative syntactic analysis of definite descriptions can be assumed, according to which they are Determiner Phrases (DPs) from a categorial point of view (Abney 1987; Giorgi & Longobardi 1991). The DP projection is a syntactically-structured domain containing several functional projections within it (Cinque 1995), possibly including a Degree Phrase or DegP (Corver 1997; Kennedy 1997). The analysis tree for the DP *the brightest man* would be as in (6), where the arrows indicate that a raising movement operation has taken place:

[4]This line of criticism originates with Wettstein's (1991:250–251) observation concerning incomplete definite descriptions such as *the murderer*: "There will be any number of ways to fill out the description so as to yield a [complete] Russellian description (e.g. 'Harry Smith's murderer', 'the murderer of Joan Smith's husband', 'the murderer of the junior senator from New Jersey in 1975') and in many cases there will be nothing about the circumstances of utterance or the intentions of the speaker which would indicate that any of these [complete] Russellian descriptions is the correct one." A reviewer suggests that the indeterminacy problem is only problematic if we do not separate determination by a speaker from determination by an analyst. The speaker will always have a determinate context set in mind, and that would be the relevant set here. The fact that it cannot be determined by others is simply a consequence of the opaqueness of other minds.

(6)



The superlative operator heads the functional projection DegP and the adjective raises and syntactically incorporates into the operator. Despite the fact that they constitute a syntactic and morphological word, at the level of Logical Form the roles of the superlative operator and the adjective remain distinct. Heim (1985, 1996) proposes the following characterization of the semantics of *-est*:[5]

(7) -est $=_{df}$ $\lambda R.\lambda x.\exists d[R(d)(x)\&\forall y \neq x[\neg R(d)(y)]]$

English *-est*, or its morphological correlate in other languages, combines with a gradable property (a relation between individuals and degrees) and yields a property of individuals (a set). The restricted determiner *the* takes this property as its first argument. The superlative operator is a binary function that is true of a gradable property (R) and an individual (x) if and only if there is a degree d such that x has the property R to d and no other individual has property R to that degree.[6]

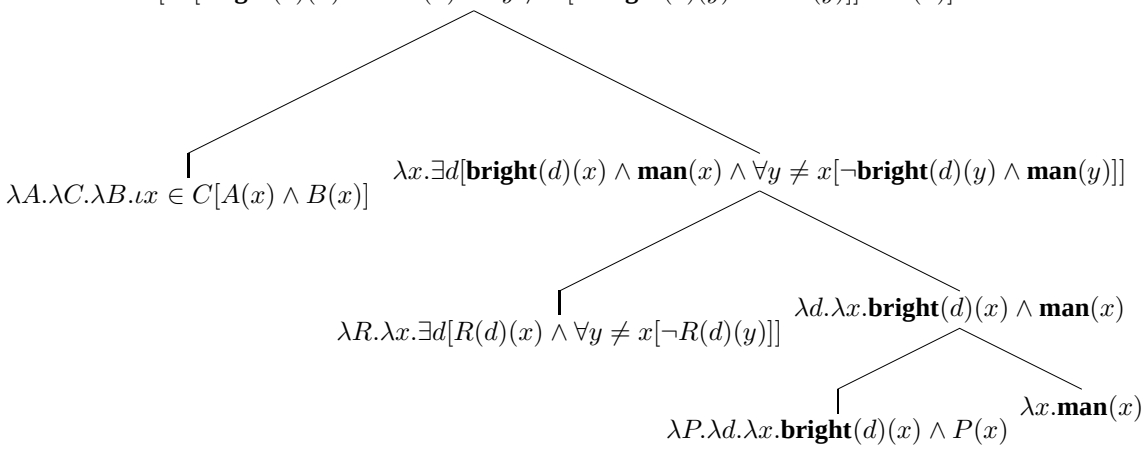
(8) *John is the brightest man* $\rightsquigarrow$
-est(**bright man**)(**John**) is True iff there is a degree such that John is bright to that degree and no other man is bright to that degree.

[5]As pointed out by Hans Kamp, the statement above works only for singular descriptions. The superlative DP *the brightest men* would require an amendment in which more than one individual is compared and separated from the rest of the individuals who have the property under consideration (being bright). According to an anonymous reviewer, other problematic case for Heim's view would be the treament of superlatives such as *slowest*. In general, it has ben argued that quantification over degrees should not involve points on a scale but rather intervals – cf. Kennedy (2001), and Schwarzschild & Wilkinson (2002). Nevertheless, the formulation in (7) will suffice for the purposes of this paper.

[6]Note that the variable x is not bound by the existential quantifier associated with the superlative operator. In other words, $-est$ is not defined as $\lambda R.\exists x.\exists d[R(d)(x)\&\forall y \neq x[\neg R(d)(y)]]$. If this were the case, the D position would be empty and we would not predict the ungrammaticality of **John is a brightest man*, **John and Peter are most brightest men*, etc.

The semantic tree for (8) would be as follows:

(9) $\lambda C.\lambda B.\iota x \in C[\exists d[\textbf{bright}(d)(x) \wedge \textbf{man}(x) \wedge \forall y \neq x[\neg \textbf{bright}(d)(y) \wedge \textbf{man}(y)]] \wedge B(x)]$



3 Context dynamics

3.1 A functional presupposition

In this section it will be explored how discourse dynamics condition the composition of the context set restricting the definite determiner. Consider the following sentence, representing the basic case:

(10) John went to the mall. He bought his wife the most expensive present.

The above example has four readings. Under one reading, which can be construed as focus neutral, this sentence is interpreted as 'John bought his wife a present more expensive than any other present'. In the second reading, it is interpreted as 'John bought his wife a present more expensive than any other present he had bought her'. This second reading can be considered a special type of focus-dependent interpretation, one in which the tense morpheme is focused and where the past time referred to is contrasted with previous past times in which John bought presents for his wife. There are two additional standard focus-dependent readings, as a function of whether the focused constituent is *he* or *his wife*. In any case, in all four readings a "bridging" inference (Clark & Haviland 1977) or "associative" anaphor (Hawkins 1978) emerges, namely they all presuppose that John bought that present in the mall. Therefore, it seems that in the simplest instances the discourse preceding the occurrence of the superlative description determines the composition of the context set.

There are several different theories that address the problem of bridging inferences and other context-dependent factors affecting the process of domain restriction. This process can be viewed as a pragmatic mechanism by which participants in a conversation assume that others can infer an entity via plausible reasoning from discourse entities already evoked along a givenness hierarchy and its interaction with Gricean principles (especially his Maxim of Quantity). Consider for example, Prince's (1981) theory of inferentials or Gundel, Hedberg, and Zacharski's (1993) theory of reference and cognitive status. In a related fashion, within centering theory (Grosz et al. 1995), informational centers impose constraints on a speaker's use of different classes of referring expressions and establish a relation between focus of attention and perceived coherence of utterance within a discourse segment. Alternatively, one can view implicit domain restriction as

a semantic process conditioned by pragmatic factors, i.e. belonging to the semantics/pragmatics interface, as we are envisioning it here. What needs to be pinned down is how discourse dynamics determines the context set of a determiner. Dynamic semantics (Chierchia 1995; Groenendijk et al. 1995, 1996; van Eijck & Kamp 1997) advocates a move from truth conditions to context-change potentials as the central aspect in the study of meaning. In this respect, the meaning of a sentence ϕ in a discourse state s, $s[\![\phi]\!]$, is the state s' resulting from updating s with ϕ. Within dynamic semantics a non-representational and a representational variant can be identified. Non-representational dynamic semantics associates logical forms of a dynamic nature with natural-language sentences, but does not address the issue of how the dynamic construction of logical representation takes place. On the other hand, the main goal of a representational dynamic theory is to characterize the incremental construction of representations that models the cognitive states of discourse-processing agents. In a non-representational dynamic or update semantics, a model $\mathcal{M}$ is defined as a tuple $< D, W, I, F >$, where D is the domain of discourse entities, W is the set of worlds, I is the set of possibilities, and F is an interpretation function. A possibility $i \in I$ is a pair $< w, \sigma >$, where $w \in W$ and $\sigma \in D^n$. A state s is a subset of I. A state is a set of possibilities, i.e. the set of world-discourse referent pairs compatible with the information available at that stage. The translation of (10) in a semantics of this sort would be (11):

(11) $s[\![\exists t < t_{ut}[Go(t,j,m)]]\!] = \{i \in s | i(t) = \sigma_i(1)\ \&\ i(j) = \sigma_i(2)\ \&\ i(m) = \sigma_i(3)\ \&$
$i(t) < i(t_{ut})\ \&\ i(j) = i(John)\ \&\ i(m) \in i(mall)\ \&\ < i(t), i(j), i(m) > \in i(Go\_to)\}$

In a representational version of dynamic semantics, such as Discourse Representation Theory, the representation language is a "box language" of Discourse Representation Structures (DRSs). Discourse updates correspond to the inclusion of additional discourse referents in the universe of a DRS or of conditions in the set of informational conditions on discourse referents (Kamp & Reyle 1993). In more recent developments of DRT, updates are represented via state/context anchoring (cf. Geurts 1995; Frank 1997; Frank & Kamp 1997). The DRS corresponding to (10) above would be (12), where K is the DRS of input state s and the symbol $+$ represents the update relation:

(12)

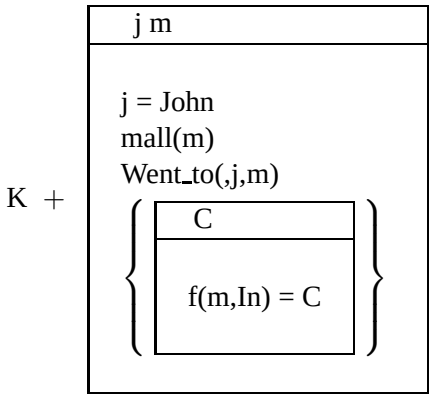
$K +$

t j m
t $< t_{ut}$ j = John mall(m) Go_to(t,j,m)

Let us now turn to the main issue of this section, namely how context sets and their dynamics are represented in DRT. As was shown in the above example, the determination of the context set of a determiner in a given discourse is relational. The relevant information from prior discourse is associated as the restriction of a determiner function. This association, which is descriptively called "bridging" in the pragmatic literature, can be seen as a genuine case of presupposition accommodation, given that the relevant set is normally not directly accessible as a discourse referent

that has been introduced previously. Formally, the determiner restriction C is accommodated as the value of a function f_x mapping a world w, an object x and a contextually relevant relation R to the set of objects y that stand in the R relation with x in w: $f_x(w)(x)(R) = \lambda y.R(w)(x)(y)$. The value of f for (10) is the set of objects in the mall in w (the set of objects that stand in the In relation with the mall in w: $f_m(w)(m)(In) = \lambda y.In(w)(m)(y)$). This function is introduced as a presupposition (contextual precondition) in a DRS (Kamp 2001a,b). In this paper I will notationally represent presuppositional content between brackets, in order to distinguish it from asserted content in a DRS. Thus, the above DRS in (12) is updated with a presupposed sub-DRS consisting of a new plural discourse referent C, and the condition $f(m, In) = C$ relating this discourse referent and the discourse referent m.

(13)

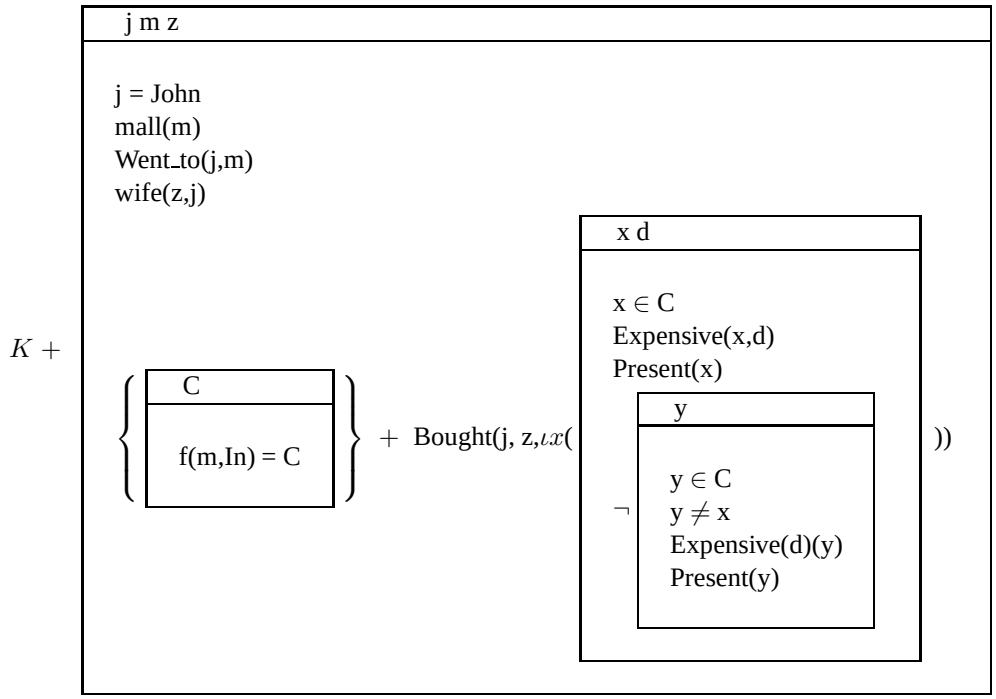


Naturally, updating a DRS with a presupposition of this sort is not an option that comes for free. Such a precondition is justified only as the basis for an update such as the one represented by the second sentence in the discourse (10). In other words, only the accommodation of this presupposed precondition fixes the content of the context set of the superlative description occurring in the second sentence of (10). This idea, although conceptually not complicated, cannot be straightforwardly captured in a non-representational dynamic model of semantic update. Consider, for example, what would be the translation of the entire discourse fragment in a standard (non-representational) update logic:

(14) $s[\![Go(j,m) \wedge Buy(j, wife(j), y) \wedge y = \iota x \in f_m(w)(m)(In).\exists d[Expensive(x,d) \wedge Present(x) \wedge \neg\exists y \neq x[Expensive(d)(y) \wedge Present(y)]]\!] = \{i \in s| \ldots\}$

Here the relation that we have just established between the accommodated functional presupposition and the context set of the determiner is somewhat obscured, since the relevant set is directly introduced after the $iota$ operator. On the other hand, in the representational dynamic model of DRT that we are discussing, the relation between the functional presupposition and the discourse that justifies it is clear. In the following DRS, the accommodated presupposition is updated with the information corresponding to the second sentence in the discourse.

(15)



Note that the discourse referent x, which is introduced in a new DRS associated to the $iota$-condition, is required to be a member of a set C (context set condition). But C is not a member of the universe of this new DRS. Rather, it is presupposed. More specifically, the discourse referent C and the functional condition on it are part of the accommodated presupposition. The sub-DRS embedded as one of the arguments of the predicative condition *bought* corresponds to the content of the superlative operator (no other present in the context set is as expensive as x). I take this only as a provisional characterization of the content of the superlative operator, since, as will be discussed below, it can be argued that it also involves the justification of additional presuppositions.

3.2 The absolute dependent reading

When the superlative description occurs in the nuclear scope of an overt or covert adverb of quantification, the context set of the definite determiner heading the superlative description is determined by the restriction of the adverb. Consider the following examples:

(16) a. Wherever John spends his vacation, he climbs the highest mountain.

b. Whenever John has time during his vacation, he climbs the highest mountain.

The relevant interpretation of (16a) is 'In every place John spends his vacation, he climbs a mountain higher than any other mountain in that place'. Mountains are compared across different locations, determined by *wherever*. On the other hand, (16b) is interpreted as 'In everyone of his vacations, John climbs a mountain higher than any other mountain'. In this case, mountains are compared across different times, determined by *whenever*. In none of these two cases is it understood that John climbs the same mountain, which would be the standard absolute reading. What this seems to suggest is that, in addition to the absolute reading that has been described above, there is a variant of this reading that may require variation of the mountains under consideration with respect to locations or times. The superlative does not refer to a single mountain.

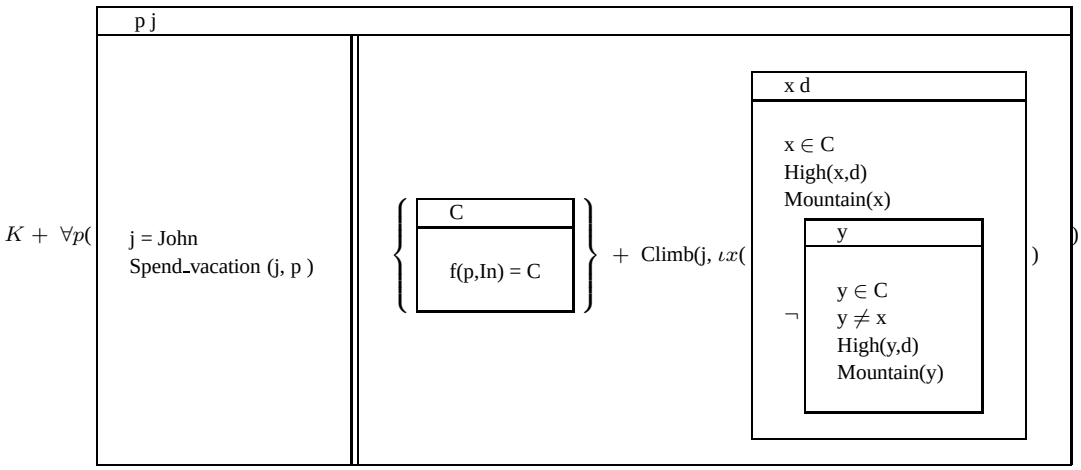
Rather, the mountain referred to varies with respect to a parameter determined by the adverb of quantification. This is clearly a case of quantificational dependence, and I will follow Farkas & Kiss (2000) in calling these readings "dependent absolute readings". They should be distinguished from the comparative reading in that in the absolute dependent case John is not being compared to other potential climbers and is not in focus. Each value of the location (place/time) variable bound by the adverb of quantification is associated with a unique mountain in that location. In sum, the observed variation is a by-product of quantificational dependence. In the same vein, it is easy to see that the following example also has dependent absolute readings:

(17) When John goes on a business trip he buys his wife the most expensive present

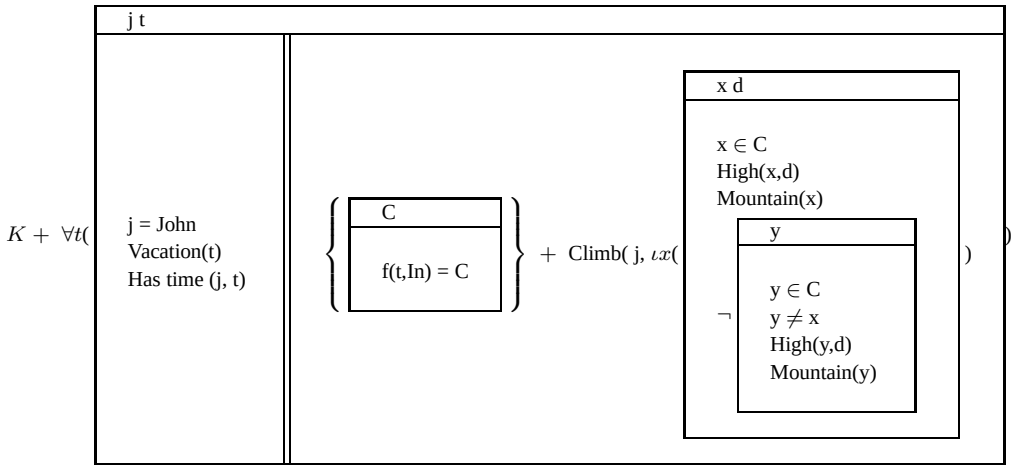
Obviously, (17) is interpreted as 'Every time John goes on a business trip, he buys his wife a present more expensive than any other present available in that place/on that trip', and not as 'Every time John goes on a business trip, he buys his wife a present more expensive than any other present (for example the most expensive diamond in the world)'. Again, the only absolute reading that is possible is the absolute dependent reading, which induces variation of the value of the variable associated with the superlative with respect to the variable bound by the *wh*-element (or adverb of quantification).

Let us now consider how the absolute dependent readings of the examples in (16) are derived at the semantics/pragmatics interface. The value of the function f (the context set) comes from a relation accommodated from information present in the restrictor. The set C of contextually relevant entities is introduced as a precondition of the main predicate in the nuclear scope. In (16a) a place variable p is quantified over; in (16b) a temporal variable t is involved. The relevant function is, for (16a), $f_p(w)(p)(R)$, where R is a spatial situation relation associating places and objects. Using the prefix notation for generalized quantifiers introducing duplex conditions (van Eijck & Kamp 1997:224), the absolute dependent readings of these sentences correspond to the following two DRSs:

(18)



(19)



There are other types of dependent absolute superlatives (Farkas & Kiss 2000), more specifically, those nominal in nature. The definite determiner may depend on a c-commanding nominal quantifier that induces covariation. For example, in (20) the choice of the relevant (highest) mountain varies with every student x under consideration:

(20) Every student climbed the highest mountain.
'For every student x, x climbed the mountain that was highest among the mountains contextually associated to x.'

The existence of absolute dependent readings suggests a treatment of these interpretations as a variety of functional readings. In both cases we observe a functional dependence between *wh*-words and definite quantifiers (Engdahl 1986; Chierchia 1993; Gutiérrez-Rexach 1997). More evidence confirming this parallelism comes from the fact that possessive determiners, which express the intension of the relevant function, also force the absolute dependent reading:

(21) a. Every student read the longest book in his reading list.
b. Most athletes pursue their highest dream at the peak of their careers.

In (21a) each student under consideration is associated with one of the books in his reading list (the longest one). In (21b) every athlete, in the majority determined by *most*, pursues one of his own dreams (the highest one). Again, the strict absolute (non-dependent reading) is blocked. Not all the students read the same book (the longest) or all athletes pursue the same dream, which is the highest.[7]

The treatment of absolute readings that is being pursued here suggests an anaphoric treatment of the relationship between the presupposed (accommodated) information and the context set restricting the determiner. The value of the implicit restriction C for a determiner **D** will be determined in a manner similar to anaphora resolution, a point that clearly follows from a treatment of presuppositions as anaphors (van der Sandt 1992). More evidence in this direction comes from the effects that emerge from the interaction of static or dynamic conjunction with implicit restrictions. When sentences are linked by connectives that are not dynamic, such as disjunction, a potential context set created from information in the first disjunct is not accessible to a superlative description in the second disjunct. Consider the following examples:

[7] A reviewer points out that this analysis is similar to van der Sandt's (1992) treatment of the blocking of the wide-scope presupposition of *Every man loves his wife*. This might be an additional argument in favor of the proposal to let the context dependence of superlatives be partly a function of the definite determiner.

(22) a. Either John went to the mall or he bought his wife the most expensive present.

b. Either John goes on vacation or he climbs the highest mountain.

In the above sentences, the context set for *the* cannot be resolved using information from the first disjunct, i.e. the present that John bought for his wife in (22a) was not purchased in the mall, and the mountain John climbs in (22b) is not located in the place where he spends his vacation. On the other hand, modal operators do not block context set accessibility, as shown by the sentences in (23).

(23) a. John went to the mall. He might buy the most expensive present for his wife.

b. Every student thinks that he might read the longest book in his reading list.

4 Context sets and the scope of the comparison

There are two alternative views on the scope of the comparison induced by the superlative operator. One theory, which we will label the "identity theory", does not distinguish between the implicit restriction of the definite determiner and the restriction associated to the superlative operator that constitutes the scope of the comparison. For example, in Heim's (1996) proposal the contextually determined domain restriction is a parameter of the superlative operator and the members of this context set are degree properties. Alternatively, one can differentiate the contribution of the definite determiner and the superlative operator, given that they arguably are syntactically and semantically distinct. From this viewpoint, which is the one advocated in this paper, there is a division of labor between the context set that restricts the definite determiner and the scope or frame of the comparison, mirroring the differential roles of the definite determiner and the superlative operator. Context sets only restrict determiners, as in Westerståhl's (1985) original proposal. Superlative operators may be restricted by additional presuppositions and by an expression denoting the frame of the comparison.

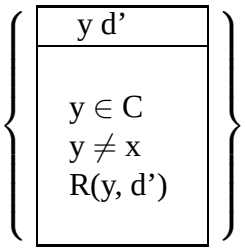
Let us consider an example of these additional presuppositions. Groenendijk et al. (1995) claim that a presupposition has to be accommodated to derive the context sets of the following superlatives, namely that all the objects under consideration are not equally expensive.

(24) a. I bought thirty books last month. I shouldn't have bought the most expensive one.

b. I bought my daughter ten Christmas presents. She liked the most expensive doll.

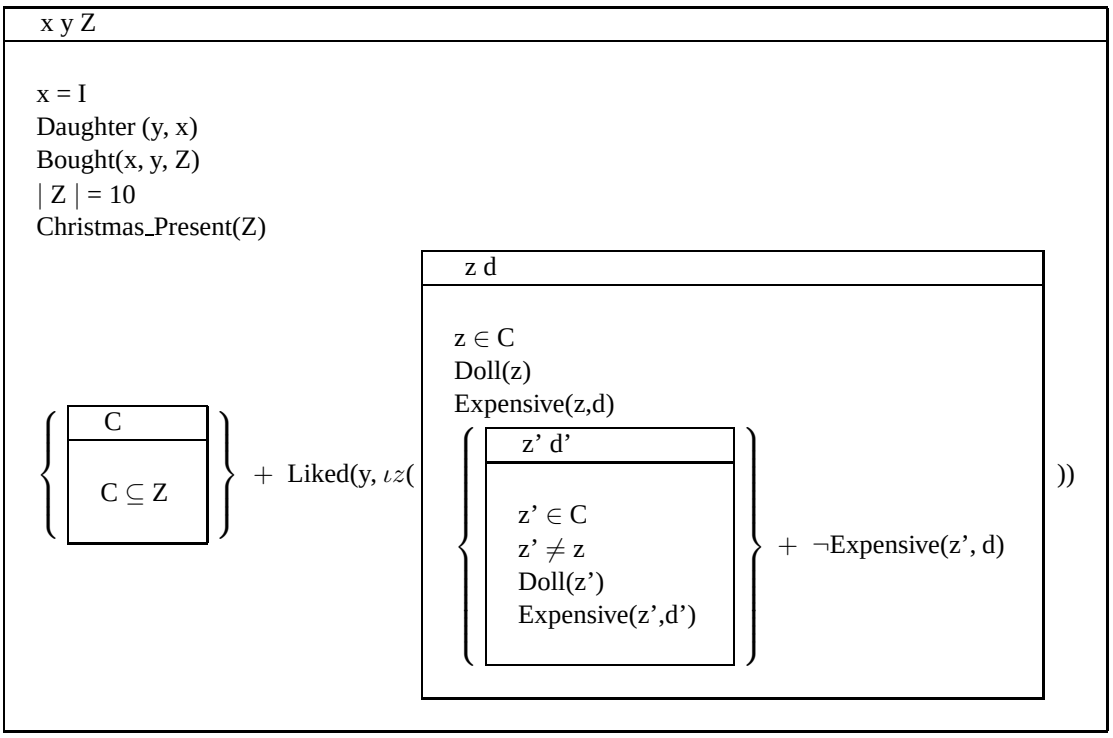
In (24a) it is presupposed that not all books are equally expensive; in (24b) what is presupposed is either that not all Christmas presents are equally expensive or that not all dolls are equally expensive. This content can be considered a presupposition of the superlative operator and not related to the context set of *the*, given that it is related to degree discourse referents: not all properties of degrees under consideration are equal. More specifically, what is presupposed is the existence of a set of alternative degree properties. The remaining members of the context set have property R to degree d', which is asserted to be less than d. The DRS (25) is the sub-DRS corresponding to this presupposition.

(25)



We are now in a position to spell out the DRS for (24b), which includes two presuppositions: the presupposition associated with the definite providing its context set, and the presupposition of the superlative operator (non-identity of the degree properties associated with the individuals in the context set). Note that the presupposition of the superlative operator is based on the presupposition of the definite determiner to the extent that only alternative degree properties that apply to the individuals in the context set are considered.

(26)



The second type of restriction affecting the superlative operator determines what we will call its frame of comparison. In the following sentences, the expressions *in the sports sections* or *of the foreigners* delimit the frame of comparison.

(27) John went to the store. He bought his wife the most expensive present in the sports section.

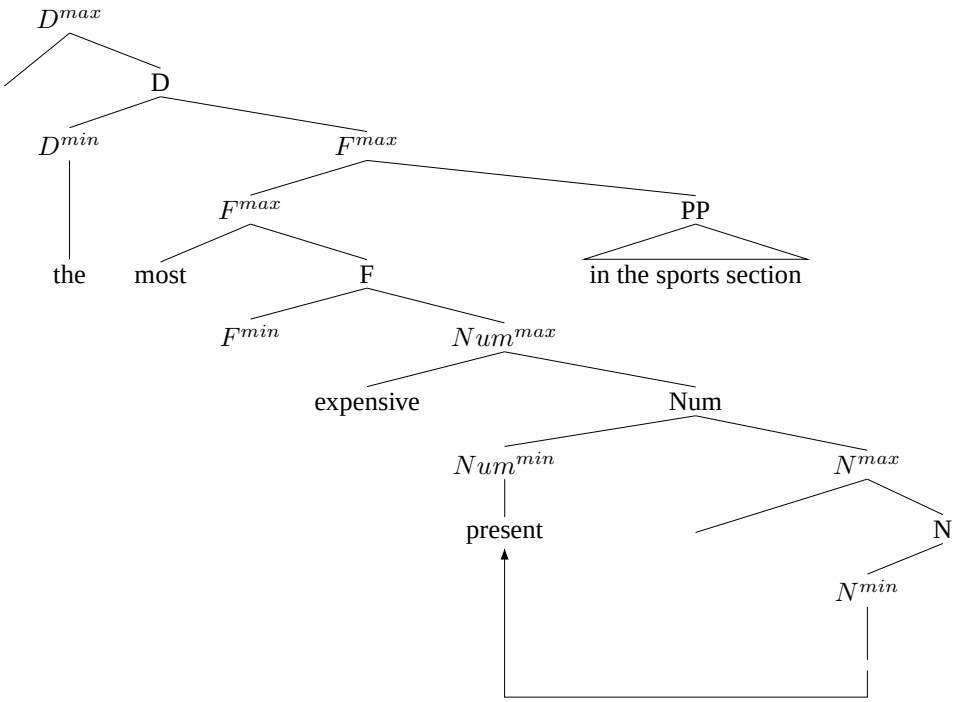
(28) a. There are ten MA and thirty-five PhD students in our department. The smartest is Sasha.

b. There are ten MA and thirty-five PhD students in our department. The smartest of the foreigners is Sasha.

Syntactically, the prepositional phrase acting as the frame of the comparison adjoins to the maximal projection containing the superlative operator. In the following analysis tree, corresponding

to the DP *the most expensive present in the sports section* in (27), the superlative operator is generated as the head of a functional phrase (with a degree feature) and *most* occupies its specifier. The PP *in the sports section* adjoins to the maximal projection hosting the degree feature associated with the superlative – cf. Corver (1997); Rijkhoek (1998); Demonte (1999); Matushansky (2002) among others for more details on the syntax of degree operators within the DP projection:

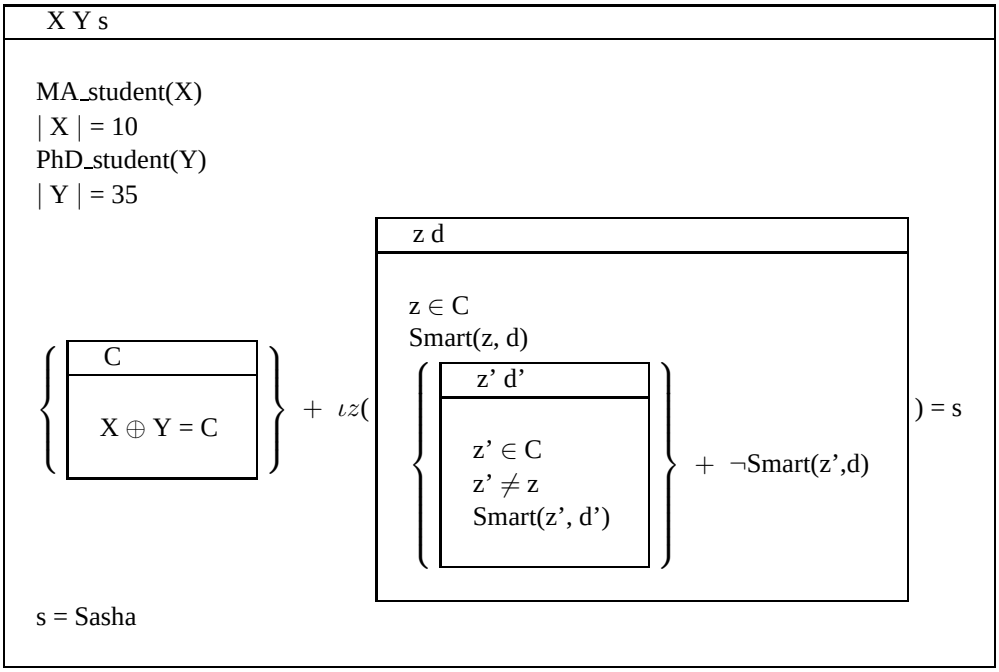
(29)



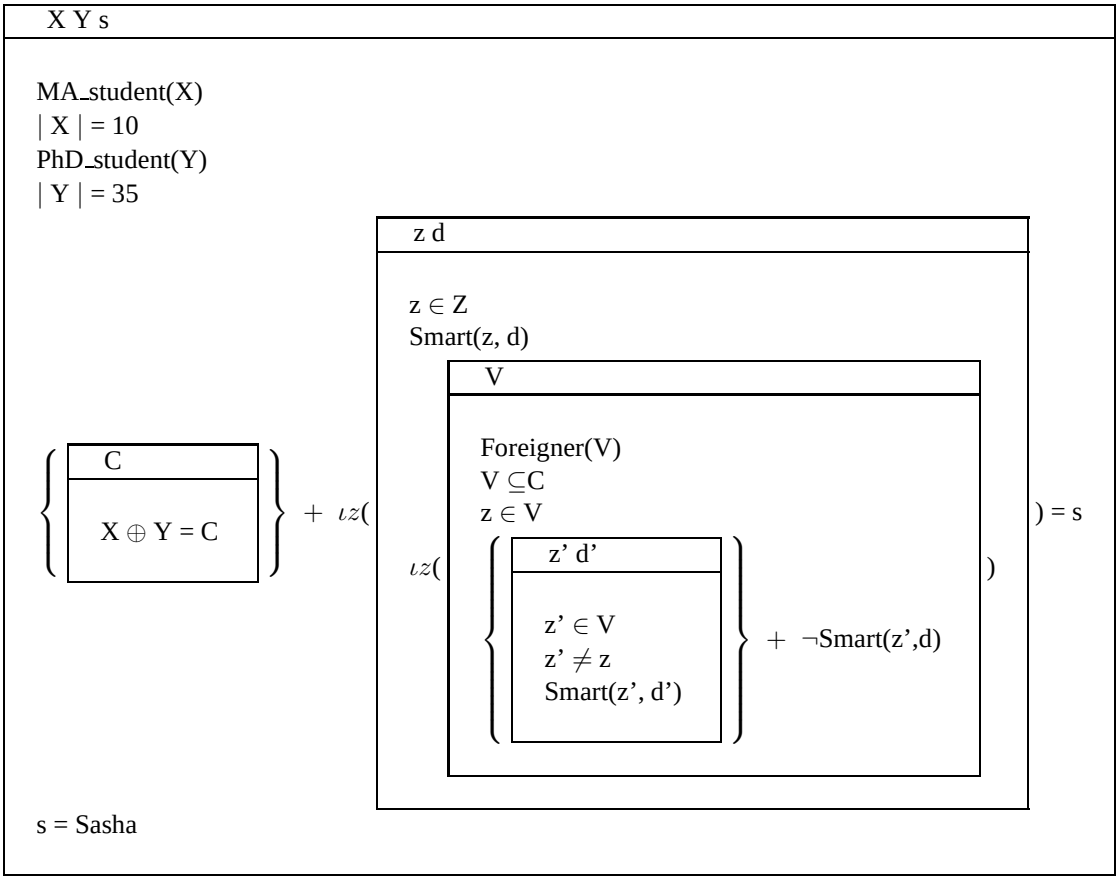
In (27) the context set is retrieved after accommodating the function $f_p(w)(p)(In)$ and adding the discourse referent C. The resulting context set is $\lambda x.In\_store(x)$. The frame of comparison restricts the denotation of the superlative further to $\lambda x.In\_sports - section(x)$.

The DRSs below represent the discourses in (28).

(30)



(31)



The determiner *the* in (28a,b) is restricted by the same context set: the students in the MA or PhD program ($\lambda x[MAStudent(x) \wedge PhDStudent(x)]$). In (28a) there is no comparison frame. In (28b) the presence of the PP adjunct triggers the introduction of a condition restricting the comparison class of the superlative. The second difference between these two sentences is that the presupposition triggered by the superlative, namely that the other individuals under consideration are not smart to a certain degree d (the degree of Sasha's intelligence), is in the scope of the adjunct. This amounts to the effect that the comparison is first restricted to the individuals in the context set of the higher definite determiner and, afterwards, it is further restricted to the context set of the second determiner. The main consequence of this stepwise procedure is that it is not possible that the individual satisfying the superlative definite description be a member of the set of foreigners but not a member of the set of MA or PhD students.

Farkas & Kiss (2000) observe that when the overt content of an N' is incompatible with further implicit restriction, the comparative reading will not be available. In the following example, only the absolute reading is possible.

(32) John/Who climbed the highest mountain in the US?

The explanation for this fact comes from the interaction of the two types of restrictions on the superlative operator that we have just discussed: the presupposition of alternative degree properties and the frame of comparison. When the PP adjunct restricts the frame of the comparison to a unique individual, the presupposition that there are other degree properties (applicable to other individuals in the context set) is not satisfied. Thus, the comparative reading would give rise to a presupposition failure and cannot be generated. Nevertheless, it has to be noted that certain

comparative readings are possible indeed. For example, sentence (33), which only differs from (32) in the addition of the temporal modifier *this time*, has a comparative reading based on event comparison, namely John's climbing is compared to prior climbings.

(33) John climbed the highest mountain in the US this time.

Finally, the presuppositions of the superlative operator can be of a modal nature. This is the case with Fauconnier's (1975) quantificational superlatives, as in *John cannot solve the easiest problem* or *The simplest problem baffles Alex*. In these cases, according to Fauconnier's observation, the superlative seems to have universal force ('John cannot solve any problem', 'Any problem baffles Alex'). In addition to the overt adjectival restriction on the superlative (*easy, simple*) there are additional modal presuppositions that give rise to the observed widening effects in interpretation.

5 Superlatives and focus

5.1 A locality restriction

In this section the discourse representation of comparative readings will be explored. Let us first consider the basic examples in (2), repeated here as (34a,b), again:

(34) a. $[\text{John}]_F$ bought Lisa the most expensive present.
'John bought Lisa a present more expensive than the presents that anybody else bought Lisa.'

b. John bought $[\ \text{Lisa}\ ]_F$ the most expensive present.
'John bought Lisa a present more expensive than the presents that he bought anybody else.'

As was previously discussed, it is a well-established fact that the source of the comparison is related to the focused constituent in a sentence. Nevertheless, in order to provide a satisfactory semantics for the comparative reading of superlatives it is not only required to spell out how this reading is related to or even follows from information-structure considerations but also several additional properties should be accounted for. First, the effects of focus are local to the sentential domain. When the focused constituent occurs in a different sentence or in the restrictor of a tripartite quantificational structure, the comparative reading does not arise. The superlatives in the following discourses lack comparative readings.

(35) a. $[\text{John}]_F$ went to the mall. He bought Lisa the most expensive present.

b. Whenever $[\text{John}]_F$ goes to the mall he buys Lisa the most expensive present.

The focused element occurs in the first sentence of the discourse (35a) and the superlative description in the second. In (35b), the focused constituent is in the restriction of a tripartite quantificational structure and the superlative is in its nuclear scope. The focus-related comparative reading becomes unavailable in both cases. In other words, (35a) lacks the reading 'John bought Lisa a present more expensive than the presents anybody else bought her'. The second sentence in (35b) also lacks this comparative reading. Assuming that comparative readings are focus-related, what this fact shows is that the focused element has to be in the same clause as the

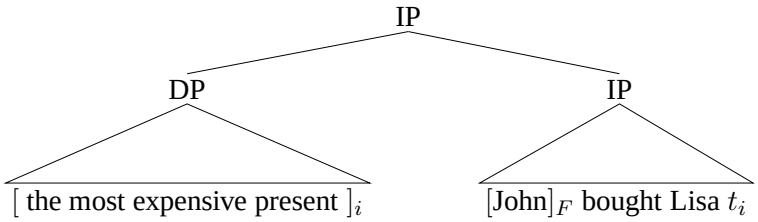
superlative description. For the comparative reading to be possible, a constituent in the local domain where the superlative DP occurs has to be focused. Compare the above sentences with the ones in (36), which do indeed have comparative readings, due to the fact that the anaphoric pronoun *he* occurs in the same sentence as the superlative:

(36) a. $[\text{John}]_F$ went to the mall. $[\text{He}]_F$ bought Lisa the most expensive present.

b. Whenever $[\text{John}]_F$ goes to the mall $[\text{he}]_F$ buys Lisa the most expensive present.

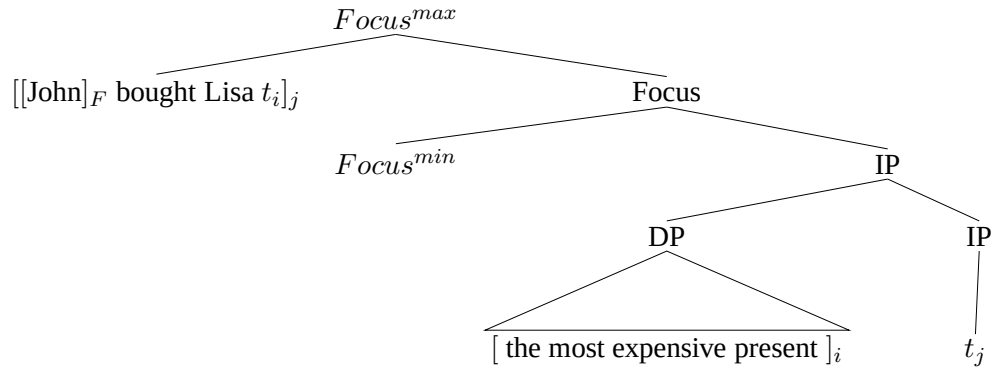
In order to explain this locality restriction on the availability of the comparative readings, we first have to determine how focus conditions the comparative reading. The relationship between focus and comparative readings can be explained if we assume that the determination of the context set is linked to the focus value (Rooth 1985, 1992) of the sentential domain – categorially, the Inflectional Phrase (IP) – where the focused constituent occurs. This determination has to take place after the operation of Quantifier Raising (QR) has applied to the superlative description at LF and has the form of a unification operation. Let us consider the syntactic derivation of (34a), a step that will help us in determining how the comparative reading is constructed at the syntax/semantics interface. The relevant steps are the following ones. First, QR applies to the superlative description (superlative DP) and adjoins this expression to the IP constituent.

(37)



In the second step of the derivation of the LF representation, the remnant-IP constituent moves to the specifier of Focus Phrase (Brody 1990, Zubizarreta 1998, etc.) The moved constituent contains the focused expression.

(38)



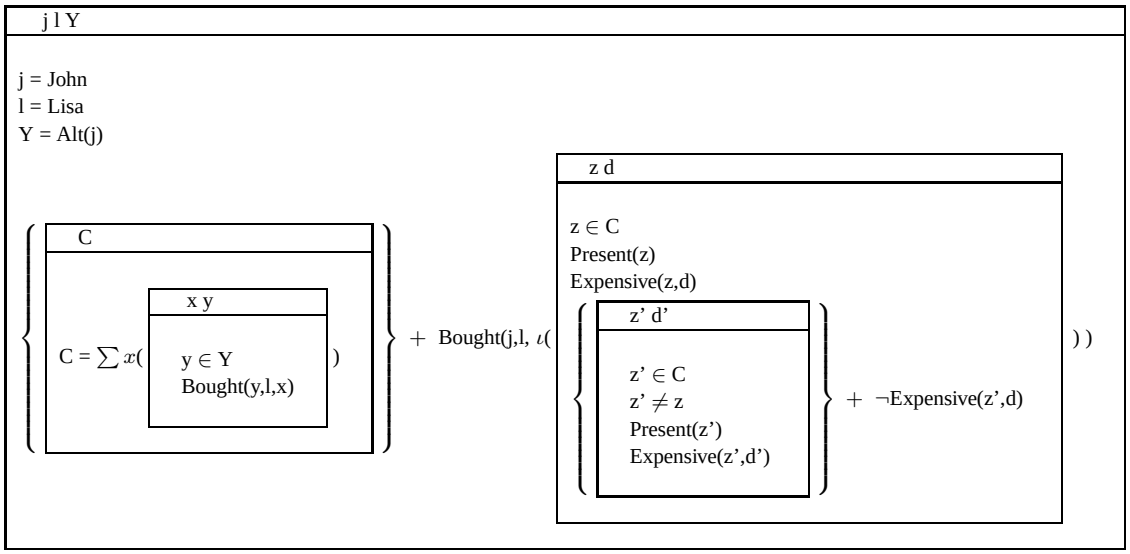
The focus value of the remnant IP can now be calculated. The focus value (FV) of this constituent in the specifier of FocusP is the set of contextually relevant alternatives y to the individual denoted by *John* in the model such that y bought x for Lisa, as in (39).[8]

[8]In Rooth's theory and related ones, the focus value of an IP would be considered to be of propositional type. For simplification purposes, here we are taking this focus value to be a set of entities (alternatives to the denotation of the constituent in focus).

(39) FV([John]$_F$ bought Lisa x) = $\lambda y.PAST(Buy(y, Lisa, x)) \wedge y \in ALT(John)$

Finally the focus value of the IP is substituted for the context set variable of the determiner as follows: Let C be the context set variable and A the variable representing the focus value of the IP. Then, C = $\lambda x.\exists y[A(y)(x)]$. Note that the type of y is the type of the members of A. In our example, C = $\lambda x.\exists y[PAST(Buy(y, Lisa, x)) \wedge y \in ALT(John)]$. In other words, the focus value of the IP will act as the context set of the superlative description. Raising of the IP to FocusP is necessary in order to check the focus feature and activate the final interpretive step. It is also necessary because the focus value of the IP would not be accessible for the context set otherwise. The resulting DRS for (34a) is (40):

(40)



Within this analysis, the locality problem instantiated by (35a) follows naturally from the interplay of standard mechanisms in the determination of scope at the syntax/semantics interface and what is needed in order to calculate a focus-based context set at the semantics/pragmatics interface. The representation of the focus value of the first sentence (the first IP constituent) has no variable corresponding to the superlative, since the superlative occurs in the second sentence.

(41) FV([John]$_F$ went to the mall) = $\lambda z.PAST(Go(z, to\_the\_mall)) \wedge z \in Alt(john)$

Due to the locality of scope assignment (May 1985), the superlative cannot scope out of its local sentential domain and, consquently, a context set derived from this first sentence will not establish the proper unification relation with the determiner. Note that there is no restriction on the type of the alternative-set. The relevant set of alternatives is not restricted to the values of individual variables (corresponding to individual participants or theta-role bearers) and can be based on the type of eventive modifiers. For example, sentence (42) has an absolute and a comparative reading:

(42) John climbed the highest mountain [yesterday]$_F$

The comparative reading, which can be paraphrased as 'John climbed yesterday a mountain higher than the mountains he climbed any other day', is derived taking as a basis the following sentential focus value:

(43) FV(John climbed x yesterday$_F$) = $\lambda M[M(Climb(x)(j)) \wedge M \in ALT(yesterday)]$, where M is a modifier variable.

The resulting context set is (44):

(44) C = $\lambda x \exists M[M(Climb(x)(j)) \wedge M \in ALT(yesterday)]$

5.2 Quantification and comparison

The scope-related locality restriction noted above is not the only constraint operating on the availability of comparative readings. This availability is sensitive to the semantic class to which a focused quantifier belongs. For example, the following sentences lack comparative readings based on the focused constituent:

(45) a. [Everybody]$_F$ climbed the highest mountain.

b. [Several/many men]$_F$ climbed the highest mountain.

c. [Fewer than three men]$_F$ climbed the highest mountain.

In (45a) a universal quantifier (*everybody*), in (45b) a vague or approximative quantifier (*several /many men*), and in (45c) a decreasing quantifier (*fewer than three men*) are respectively focused. Certain classes of indefinites may also be incompatible with comparative readings. Consider (46):

(46) a. A woman climbed the highest mountain.

b. A [woman]$_F$ climbed the highest mountain.

Sentence (46a) lacks a comparative reading when the indefinite *a woman* has just an existential (non-specific) interpretation. On the other hand, if this indefinite is understood as referential or specific, or if it is focused as in (46b), the comparative reading becomes possible. This is clearly the case for the latter sentence in a context in which we are talking about two separate groups of men and women and we assert that a woman (not a man) climbed the highest mountain – i.e. it was a member of the group of women under consideration who climbed a mountain higher than the mountains climbed by any of the members of the group of men. Cardinal quantifiers exhibit the same behavior as indefinites: they trigger comparative readings when they are specific or focused. This is also the case with overt or covert partitives:

(47) a. More than three men climbed the highest mountain.

b. Several of the men climbed the highest mountain.

c. Two of your five cousins climbed the highest mountain.

The explanation for this sensitivity of certain quantifier classes to comparison has to do with the type of operation entailed by focusing, namely the calculation of alternatives, and how it conflicts with the presuppositions of quantifiers. In order to build the contrast set of alternatives (ALT), we need to be able to identify potential individuals to which the context-set predicate does not apply. This requirement eliminates universal quantifiers because the property in question applies

to every individual in the resource domain. It also eliminates non-focused/non-specific indefinites and non group-denoting partitive quantifiers because the determiners that head them lack a context set argument (Gutiérrez-Rexach 2001). For example, the following context set would entail a contradiction, since *everybody* would require to apply a property to all the members of a contextually given domain (this is the essence of universal force), but the calculation of the alternative-based context set would presuppose that the predicative property does not apply to all the individuals.

(48) C = $\lambda x.\exists y[PAST(Climb(y,x)) \wedge y \in ALT(Everybody)]$

Certain presupposition 'suspenders' (Horn 1972), such as *if anybody*, also block the comparative reading. Consider the question (49):

(49) Who, if anybody, climbed the highest mountain.

The suspender *if anybody* blocks the contextual presupposition of a *wh*-phrase, specifically in the sense that this latter term cannot be interpreted as a discourse-dependent or D-linked *wh*-phrase, in Pesetsky's (1987) terminology. It also blocks the comparative reading of the superlative. This dual blocking effect can be certainly connected because it really is an incompatibility between the comparative reading and non D-linked *wh*-phrases, no matter whether this property is intrinsic, as happens with aggressively non D-linked phrases such as *wh-the hell*, or induced by a suspender. In Gutiérrez-Rexach (1997) D-linked *wh*-phrases are analyzed as denoting interrogative determiner or quantifier functions that are inherently restricted to a context set. On the other hand, non D-linked *wh*-phrases are not discourse dependent and cannot be restricted by context sets. If this is the case, then for non context-dependent *wh*-phrases it becomes impossible to activate the mechanism needed for the comparative reading to arise, namely the introduction of a set of contextually determined alternatives. The presence of suspenders modifying other focused Determiner Phrases also blocks the comparative reading of superlatives.

(50) John/those three lunatics, if anybody, climbed the highest mountain.

The above sentence lacks the comparative reading 'John/the three lunatics climbed a mountain higher than the mountains other individuals under consideration climbed'. In sum, we have seen two additional types of blockers: certain semantic properties of quantifiers, and optional modifiers that act as presupposition suspenders.

There are also focus particles whose intrinsic presuppositional or asserted content is incompatible with those associated with the comparative reading. Consider the contrasting behavior of the particles *only* and *even* in this respect:

(51) a. Only John climbed the highest mountain.

b. Even those who started in Winter climbed the highest mountain.

Sentence (51a) is compatible with a comparative reading. What this sentence asserts is that John climbed a mountain higher than the mountains anybody else climbed. On the other hand, (51b) lacks the reading 'Those who started in Winter climbed a mountain higher than the mountains climbed by other climbers'. This is due to the fact that the meaning of *only* is compatible with the presuppositions satisfied by the comparative reading of superlatives. Concretely, [Only x ... P

$\ldots]$ states that x has property P and its alternatives do not. Hence, the presupposition of the degree operator that there are alternative degree properties applicable to alternative individuals is justified in the context created by the assertion of $[Only\ x\ \ldots]$. Let us consider now the meaning of *even* in (51b): the property expressed by *climbed the highest mountain* applies to all individuals under consideration including those in a potential alternative set to x. This does not provide an adequate background for justifying the presupposition of the superlative operator, namely that there are other degree properties that apply to the other individuals in the relevant alternative set. Compare in this respect (51b) with (52), where the scope of *even* does not extend to the second sentence, and the superlative may have a comparative reading.

(52) Even John climbed a mountain. In fact, he climbed the highest mountain.

6 Comparative readings in interrogatives

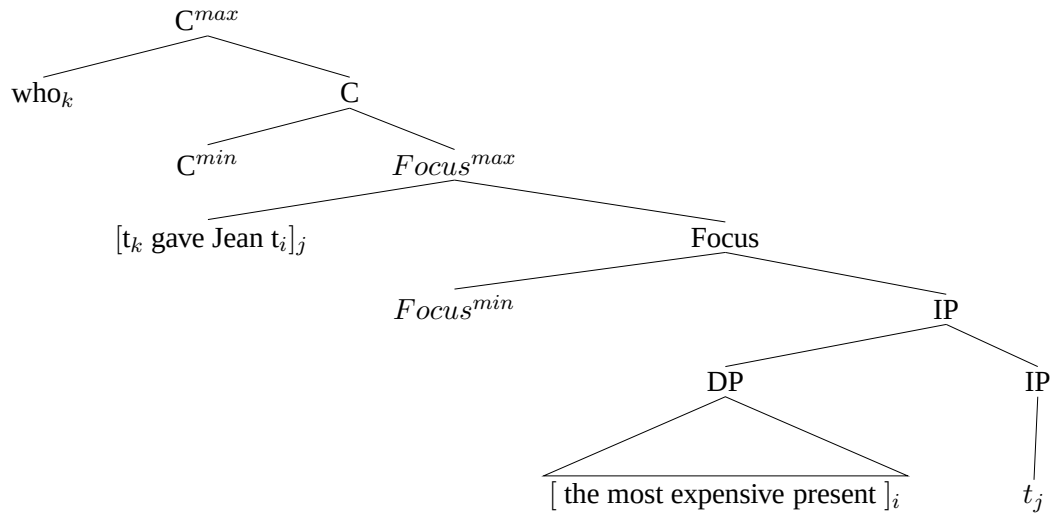
It is a well-known fact that in interrogative sentences the *wh*-word constitutes the focus of the sentence. If the hypothesis that comparative readings are intrinsically focus-dependent is correct, it should follow that interrogative sentences only allow comparative readings where the source of the comparison is the *wh*-word/phrase. This is exactly the case. A superlative DP occurring in an interrogative sentence only has a comparative reading when the comparison class is drawn from alternatives in the domain associated with the *wh*-element. Thus, the sentences in (53) normally have the comparative readings in their paraphrases:

(53) a. Who gave Jean the most expensive present?
'Who gave Jean a present more expensive than the presents that anybody else gave Jean?'

b. To whom did Jean give the most expensive present?
'To whom did Jean give a present more expensive than the presents she gave to anybody else?'

A derivation of the LF yielding the intended readings would proceed follows, provided some standard syntactic assumptions. First, the superlative description adjoins to IP, as previously shown. The remnant IP moves to the specifier of the Focus Phrase, and finally the *wh*-word moves to the specifier of CP to check its [+wh] feature, leaving a trace in the specifier of FocusP. The presence of this trace is necessary in order to associate the interrogative expression with focus. In sum, the interrogative expression has to check two features: [+focus] and [+wh]. Once this is done, the LF representation feeds semantic interpretation, i.e. it is mapped into a DRS by a DRS-construction algorithm.

(54)



The focus value of the remnant-IP expression ([t_k gave Jean t_i]) in the specifier of FocusP is calculated as shown in the previous section. As I have stated before, I assume that interrogative quantifiers are also restricted by context sets (Gutiérrez-Rexach 1997). The set of alternatives evoked by the *wh*-word *who* corresponds to its descriptive content, namely, the set PERSON ∩ A, where A is the context set of the interrogative quantifier. The focus value of the remnant IP in the specifier of FocusP is (55), the set of alternative individuals who gave something to Jean:

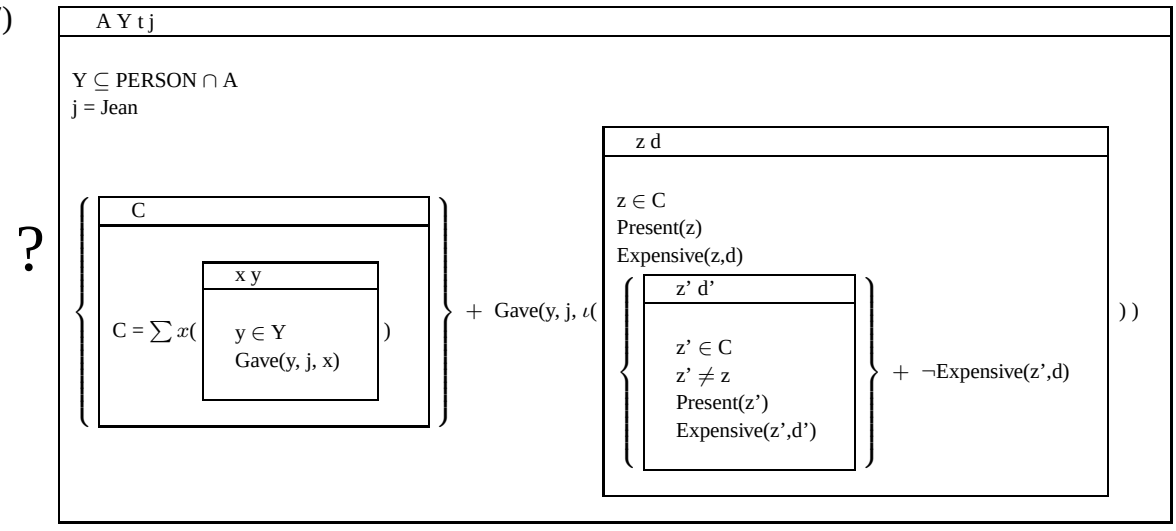
(55) FV(PAST(Give(y,j,x))) = $\lambda z.PAST(Give(z, j, x)) \wedge z \in PERSON \cap A$

This set becomes accessible to the superlative description and the context set of the definite determiner becomes (56), the set of things that were given by somebody to Jean:

(56) C = $\lambda x.\exists y[PAST(Give(y, j, x)) \wedge y \in PERSON \cap A]$

The corresponding DRS is:

(57)



When the *wh*-phrase has a restriction, there are two comparative interpretations, depending on whether the context set consists only of individuals in the denotation of the restriction or also includes other individuals. In example (58) the two different interpretations would depend on whether the context set consists of Scandinavians or of Scandinavians and non-Scandinavians, as shown in (59).

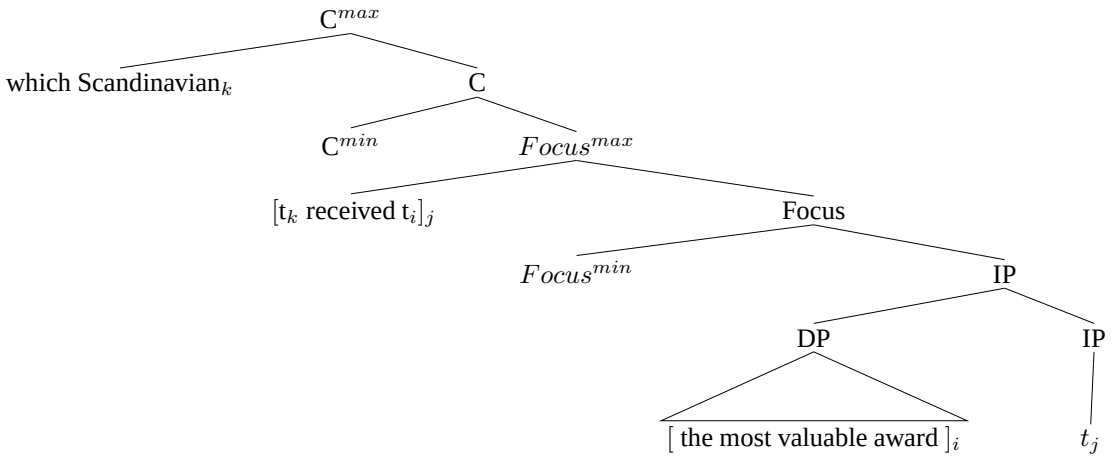
(58) Which Scandinavian received the most valuable award?

(59) a. Which Scandinavian received an award more valuable than the awards any other Scandinavian received?

b. Which Scandinavian received an award more valuable than the awards any other individual under consideration (including non-Scandinavians) received?

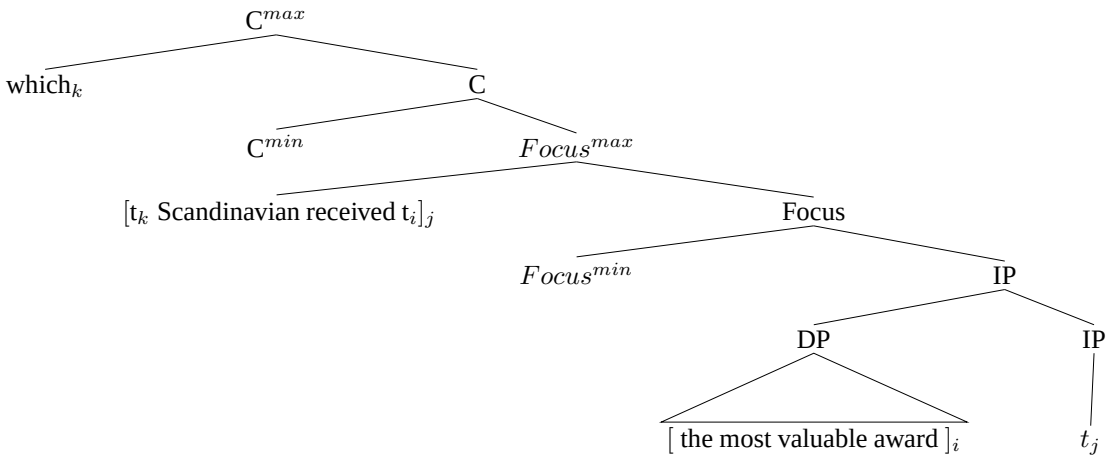
There are three potential derivations as candidates to generate the proper context set. Let us examine them. In the first derivation, the *wh*-phrase (interrogative quantifier) *which Scandinavian* moves to the specifier of CP, after adjunction of the superlative DP to IP and movement of the remnant IP to the specifier of FocusP.

(60)



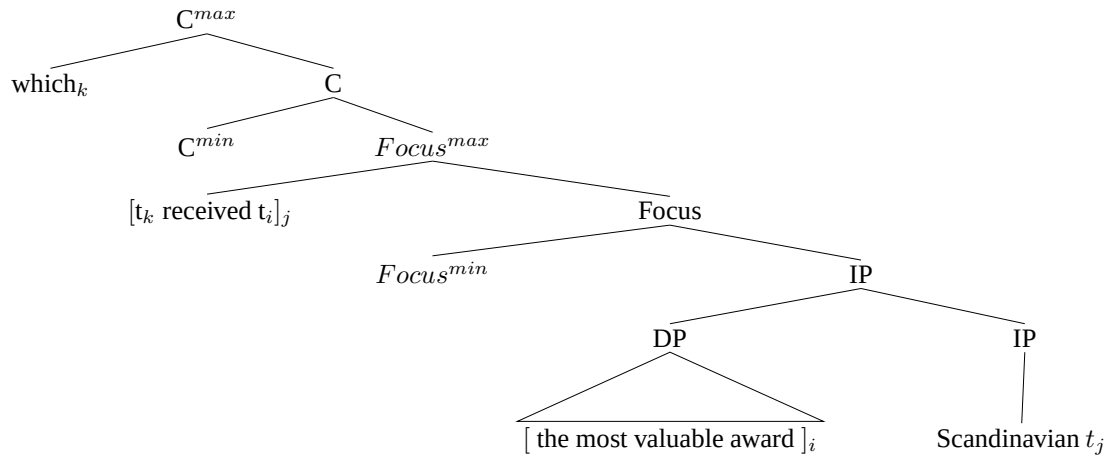
In the second alternative derivation, only the interrogative determiner *which* moves in the last step, leaving its restriction in the specifier of FocusP.

(61)



Finally, in the third potential derivation, the restriction of the *wh*-determiner stays 'in situ' within the IP and does not move with the remnant IP to the specifier of FocusP.

(62)



Let us now consider the context sets resulting from the interpretation of the three alternative LFs above. The context set in (63a) is the one corresponding to the LF (60); the context set (63b) corresponds to (61); and (63c) corresponds to (62).

(63) a. C = $\lambda x.\exists y[PAST(Receive(y,x)) \wedge y \in SCANDINAVIAN \cap A]$

b. C = $\lambda x.\exists y[PAST(Receive(y,j,x) \wedge Scandinavian(y)) \wedge y \in A]$

c. C = $\lambda x.\exists y[PAST(Receive(y,j,x)) \wedge y \in A]$

The differential composition of the context set is related to the structural position of *Scandinavian* at LF. Interestingly, the first and the second context sets are equivalent, so the LF derivations render the same readings. Whether the restriction moves to the specifier of CP or stays within FocusP does not trigger any difference in the semantic computation of the context set. Only when the restriction of the interrogative quantifier stays in situ, the context set includes alternative individuals of any nationality, not only Scandinavians.

When the superlative occurs in an embedded sentence, an interesting contrast arises depending on the nature of the embedding verb. For example, consider sentence (64):

(64) Who said that you got the fewest letters?

This sentence cannot be interpreted as 'Who said that you got fewer letters than what everybody else said?' Szabolcsi (1986) also noted this restriction, which she viewed as one more instance of a syntactic locality restriction. This reading would be associated with a structural representation in which movement of the superlative has taken place across a sentential boundary. Nevertheless, rather than viewing this property as the by-product of a syntactic restriction, it seems more accurate to make it follow from a semantic restriction, related to the nature of the embedding verb and its associated presuppositions. In the examples in (65), only the reading in which the embedding verb is not part of the context set of the definite determiner is possible.

(65) a. Who are you claiming got the most expensive present?

b. Who did you say climbed the highest mountain?

Sentence (65a) lacks the comparative reading 'Who are you claiming got a present more expensive than the presents you are claiming any other people got?'. It has, on the other hand, the comparative reading 'Who are you claiming got a present more expensive than the presents any other people got?'. In the former reading, the verb *claim* would be part of the context-set restriction of the definite determiner. In the latter reading, it is not. Similarly, (65b) lacks the comparative reading 'Who do you say climbed a mountain higher than the mountains you said any other individual climbed?'. The comparative reading in which *say* is not part of the context set of the determiner is possible: 'Who do you say climbed a mountain higher than the mountains any other individual under consideration climbed?'.

Contrastingly, in the examples of (66) both comparative readings are possible: a reading in which the embedding verb is part of the context set, and a reading in which the embedding verb is not part of the context set.

(66) a. Who do you believe got the most expensive present?

b. Which student thinks that he read the longest book?

Sentence (66a) has two comparative readings. In the first one, the verb *believe* is part of the context set of the determiner: 'Who do you believe got a present more expensive than the presents you believe any other people got?'. In the second reading, the verb is not part of the context set restricting the definite determiner: 'Who do you believe got a present more expensive than the presents any other people got?'. In a parallel fashion, both comparative readings are obtained in (66b): 'Which student thinks that he read a book longer than the books any other student thinks he read?', and 'Which student thinks that he read a book longer than the books any other student read?'.

An important difference between the verbs in (65) and (66) is that the former are speech act verbs (*say, claim*) whereas the latter are propositional attitude verbs (*believe, think*). One could assume, following Davidson (1968), that the complements of the verbs of the first type are not structured (they would stand for *that*-demonstratives) whereas the latter type of verbs embed propositional complements syntactically structured. Then, the computation of the context set does not have access to the embedding verb in (65), whereas that possibility is available in the examples in (66). This line of reasoning is somewhat problematic, since it makes predictions that seem to be too strong. Complements of speech act verbs can be subject to the same types of informational partitioning as the ones required by propositional attitude/structured proposition complements.[9] A more-promising alternative line of analysis is one that focuses on the different presuppositions of verbs and their interaction with the presuppositions of superlatives. For example, the question in (65b) presupposes that the addressee stated who the individual that climbed the highest mountain was and the speaker's question is requesting only this specific piece of information (the identity of that individual as expressed in that statement). On the other hand, the interrogative sentence (66a) poses a question about the content of a belief, which can be a belief about an individual or about a group of individuals and their respective presents (comparative reading). Stating this contrast in a different fashion, in question (65b) if we were to build the set of alternatives to x satisfying the condition 'you said x climbed y', this alternative set would presuppose that different speech acts have taken place, namely those containing different

[9] An anonymous reviewer also points out that the Davidsonian idea that propositions are syntactic objects clashes with model-theoretic semantics, which regards meanings as extra-linguistic entities.

assertions about different climbers and the mountains they climbed. This type of presupposition would be the one that would be needed to justify the presupposition of the superlative. Nevertheless, question (65a) does not warrant a presupposition of this sort, so the presupposition of the comparative reading of the superlative is not justified. On the other hand, question (66a) gives rise to the alternative set 'you believe x got y', and triggers the presupposition that the addresse may have different beliefs about different presents. This is indeed a justifiable presupposition in that context, one that provides the adequate basis for the comparative reading.

Spelling out the different presuppositions of the embedding verbs, when deriving sets of alternatives, and their interaction with the presuppositions of superlatives is not a straightforward matter. Farkas & Kiss (2000) note that a superlative embedded in a sentential complement of the verb *arrange* may also have a comparative reading:

(67) Who arranged for you to get the fewest letters?

Although I have not been able to reproduce their judgements entirely,[10] the fact that embedding verbs of other semantic classes may or may not block the comparative readings, and that speakers' intuitions seem to be variable with respect to certain cases depending on context, lends support to the treatment based on presupposition interaction advocated here.

Not only the content of the embedding verb affects the availability of the comparative reading. The nature of the *wh*-word is also a conditioning factor. Whereas individual argument questions (*who, which*, etc.) allow comparative readings, adjunct rationale and manner questions, i.e. those where the *wh*-word is *why* or *how*, block the comparative reading of the superlative. Consider (68):

(68) a. Why did you read the longest book?

b. How did you climb the highest mountain?

Sentence (68a) lacks the comparative reading 'For what reason did you read a book longer than the books you read for any other reason?'. The only possible reading is the absolute one: 'For what reason did you read a book longer than any other book?'. In a similar fashion, (68b) is not interpreted as 'In which manner did you climb a mountain higher than the mountains you climbed in any other manner?'. The absolute reading 'In which manner did you climb a mountain higher than any other mountain?' is again the only one available. Let us look at what is required to derive a comparative reading: a set of alternatives to the denotation of a constituent has to be formed. In the case of *wh*-words the set of alternatives to one of the members in the domain of the *wh*-word has to be considered. For example, in the case of *who*, the alternative set is the complement set of alternatives to an individual x. Szabolcsi & Zwarts (1993/1997) observe that the algebraic structures formed by the domains of manners (the denotational domain of the *wh*-word *how*) and reasons (the domain of the *wh*-word *why*) are join semi-lattices and are not closed under complements. What this would entail is that a context set cannot be formed taking as a basis a set of alternatives in the domain MANNER or REASON. Given that the complement operation is not defined on them, for a given manner or reason x, the set ALT(x) – basically, the set of manner/reasons y which are not x – cannot be calculated. This would make impossible the derivation of the context set of the determiner for a comparative reading.

[10] Actually, about half of of my informants group the verb *arrange* with speech act verbs in the property of lacking a comparative reading. For these speakers, (67) would not have the reading 'Who arranged for you to get fewer letters than what everybody else arranged?', although it can have the "lower" comparative reading 'Who arranged for you to get fewer letters than what anybody else got?'.

7 Existential constructions

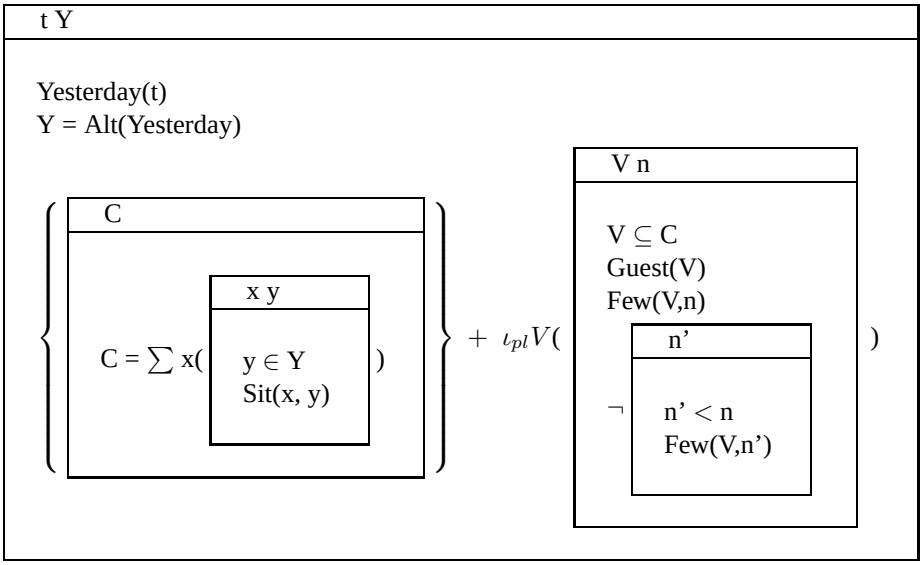
Szabolcsi (1986) also observes that in existential-*there* constructions only the comparative reading is allowed, as shown by the contrast in (69).

(69) a. *Yesterday there were the fewest guests.

b. There were the fewest guests [yesterday]$_F$.

Existential sentences obligatorily introduce non-dependent or free discourse referents (Kamp & Reyle 1993). Consequently, in (69a) the context set of the description is empty and the description fails to refer because the intersection of the denotation of the descriptive part with the empty set is always empty. The corresponding representation is not well-formed. In (69b), *yesterday* occurs in a clefted focus position. The content of the context set is provided not by the previous discourse but by accommodation of the content of *there were x* [*yesterday*]$_F$, as above. This yields the context set Y in (70), which is the set of individuals under consideration in ALT(*yesterday*):

(70)



8 Conclusion

In this paper the ambiguities that arise in the interpretation of superlatives have been addressed. It has also been argued that they can be better understood as a by-product of the context dependence of definite determiners. Finally, it has been shown that the readings associated with superlatives are the compositional result of the combination of the meaning of definite determiners (understood as determiner functions restricted to a context set), the superlative operator *-est*, and the dynamics of context sets in discourse, as they interact with focus interpretation. Using a basic and straightforward model for the dynamic interpretation of syntactically analyzed LF-structures, it has also been argued that there are structural or 'interface' constraints that condition the availability of a certain context set too. In sum, well-known factors related to context, focus, and the grammatical interfaces (namely, the syntax syntax/semantics and the semantics/pragmatics interfaces) conspire to produce an apparent multiplicity of readings. If this is correct, we have a powerful argument for a simpler account of the semantics of comparatives and superlatives.

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INFORMATION DEPENDENCY IN QUANTIFICATIONAL SUBORDINATION

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Abstract

The purpose of this paper is to (a) show that the received view of the problem of quantificational subordination (QS) is incorrect, and that, consequently, existing solutions do not succeed in explaining the facts, and (b) provide a new account of QS. On the received view of QS within dynamic semantic frameworks, determiners treated as universal quantifiers (henceforth *universal determiners*) such as *all, every*, and *each* behave as barriers to inter-sentential anaphora yet allow anaphoric accessibility in a number of situations. We argue that universal determiners are not intrinsic anaphora barriers and that anaphoric accessibility under them is enabled by factors including lexical information and discourse effects of universal determiners. In support of this viewpoint, we first provide a data survey on the phenomena of QS and its interactions with plurals, rhetorical relations, and adverbial quantification. The results of the survey show that judgments of (naive) native English speakers on the QS examples are quite different from what is claimed in the literature. We argue that the various solutions in the literature, which in general accept that universal determiners are intrinsic anaphora barriers, fail to account for the facts from the survey data. We then describe the approach we adopt, which denies that universal determiners are anaphora barriers and which reconstructs their semantics so that information in their scope can be released for anaphora. The constraints on QS noted in the literature we model in Segmented Discourse Representation Theory (SDRT) as conditions on the discourse relations which can hold between subordinated constituents. We show that this approach accounts for the QS data.

1 Introduction

The term *quantificational subordination* (QS) refers to instances of anaphoric dependence of pronouns on antecedents introduced under the scope of quantificational anaphora barriers (QAB). In formal semantic theories, and in dynamic semantics in particular, such barriers include the determiners *all, every,* and *each*. The problem of QS is that "robust" dynamic semantic theories, as presented in e.g. Kamp (1981), Heim (1982), and Groenendijk & Stokhof (1991), make any antecedent introduced under the scope of a QAB inaccessible for anaphoric binding; nonetheless, sometimes antecedents introduced in these positions are in fact anaphorically accessible. For example, consider the discourses (1), (2)[1] and (3). In the present section, we report judgments found in the literature without considering the results of our survey. The survey results with respect to these examples are presented in section 2.

(1) a. Every hunter that saw *a deer*$_1$ shot *it*$_1$.

b. **It*$_1$ was a female.

[1](1) and (2) are simple variations of examples in Roberts (1996).

(2) a. Every hunter that saw *a deer*$_1$ shot *it*$_1$.

b. *It*$_1$ died immediately.

(3) a. Every chess set comes with *a spare pawn*$_1$. (B. Partee, in Roberts 1987)

b. *It*$_1$ is taped to the top of the box.

In these discourses, the universal determiner *every* is generally assumed to block anaphoric accessibility to the indefinite introduced within its scope. For instance, in (1), the pronoun *it* in (1b) cannot depend on the indefinite *a deer*, for it is introduced under the scope of the determiner *every* in (1a). This fact is predicted by standard dynamic semantics. However, the universal determiner *every* does not prevent the singular pronoun in (2b) and (3b) from accessing the indefinite under its scope in (2b) and (3b). This problem has been discussed by many authors (e.g. Sells 1985; Roberts 1987, 1989, 1996; Poesio & Zucchi 1992; Gawron 1996).[2]

1.1 Varieties of QS

It turns out that a number of phenomena also standardly considered within dynamic semantic theories interact in interesting ways with QS. In this section, we will consider the interactions of QS with plurals, rhetorical relations, and adverbial quantification. We will try to show that QS is not an isolated phenomenon, but shares many properties with other anaphoric phenomena, and that there are a number of distinct mechanisms that can facilitate QS.

QS and Plural Anaphora

Standard dynamic semantic theories have problems explaining the interaction of pronominal number with anaphoric accessibility. Standard dynamic accounts predict the unacceptability of (4a,b) and the acceptability of (5a,b) as well.

(4) a. *Every student*$_1$ went to school.

b. **He*$_1$ brought lunch boxes.

(5) a. *Every student*$_1$ went to school.

b. *They*$_1$ brought lunch boxes.

The felicity of the discourse (5a,b) is generally considered to be data that a theory of plurals in dynamic semantics has to explain. However, just as in the problem of quantificational subordination, the assumption that the determiner *every* is a QAB plays a prominent role.[3] Since the

[2]For many scholars, the problem of QS is closely related to the problem of modal subordination (MS), shown in (i) and (ii).

(i) *A wolf*$_1$ might come in. *It*$_1$ would eat you first. (F. Landman, in Roberts 1987)

(ii) *A wolf*$_1$ might come in. **It*$_1$ is hungry.

The difficulty here is how to explain the felicity of (i) and the infelicity of (ii). In the present paper, modal subordination is not our main focus; however, we believe that the approach described admits a straightforward extension to it. We will make some programmatic comments to this effect in the final section.

[3]See Kamp & Reyle (1993); van den Berg (1996); Krifka (1996) and Asher & Wang (2003) for different solutions to the problem.

problem of plurals and the problem of QS are related to each other in dynamic semantics by virtue of this shared assumption, it seems desirable to solve both of them through the use of a single mechanism, if possible. To make this point even clearer, it is easy to find examples of discourses in which both problems appear simultaneously. An example is (6a,b).

(6) a. *Every man*$_1$ loves *a woman*$_2$.

b. *They*$_1$ send *them*$_2$*/her*$_2$ flowers.

In (6b), the pronoun *they* refers to the men introduced in (6a), an instance of the problem of plurals; in addition, the pronoun *them* in (6b) refers, on its most salient reading, to the women introduced under the scope of *every*, an instance of (plural) quantificational subordination. The challenge here is to keep dynamic semantics' good predictions for plural anaphora while rectifying its deficiencies for singular pronouns with antecedents within QAB.[4]

Plural anaphora also triggers another problem, exemplified by (7a,b),

(7) a. *Every farmer*$_1$ who owns *a donkey*$_2$ beats *it*$_2$.

b. *They*$_1$ treat *it*$_2$/*them*$_2$ cruelly.

Besides being a straightforward case of QS, (7b), like (6b), seems to be unselective with respect to pronominal number in the second argument. Approaches to donkey anaphora which take the pronoun *it* in (7a) to be number neutral, such as e.g. Neale (1990), argue that (at least) this type of pronoun lacks semantic number and requires only syntactic agreement. However, the unselective nature of the pronouns in (7b) and (6b) shows that this cannot be the whole story; given that both singular and plural pronouns are allowed, the effect of syntactic agreement is unclear here.[5] Further, many people prefer the plural pronoun *them* in (7b) and (6b).

QS and Telescoping

As predicted by traditional dynamic semantics, the universal determiner *every* in (8a), as a QAB, makes the use of the singular pronoun *he* in (8b) unacceptable.

(8) a. *Each student*$_1$ in the syntax class was accused of cheating on the exam.

b. **He*$_1$ had a Ph.D. in astrophysics. (Fodor & Sag 1982)

It often is noted in the literature that universally quantified NPs can also serve as antecedents for singular pronouns like *he* in (9b) and (10b). This phenomenon is known as *telescoping* (Roberts 1987 and Poesio & Zucchi 1992).

(9) a. *Each student*$_1$ in the syntax class was accused of cheating on the exam.

b. *He*$_1$ was reprimanded by the dean. (Fodor & Sag 1982)

[4]There are also cases similar to plural quantificational subordination in modal subordination contexts. Discourses like "*Some mosquitos*$_1$ might come in the house. *They*$_1$ would bite you" or "*A mosquito*$_1$ might come in every room in this house. *They*$_1$ would bite someone in the room" seem to fall directly into this category. Just as in plural quantificational subordination, plural modal subordination turns out to cause trouble for previous approaches to modal subordination.

[5]See Kanazawa (2001) for more criticism of number neutral approaches.

(10) a. *Each degree*$_1$ candidate walked to the stage.

b. *He*$_1$ took his diploma from the dean and returned to his seat. (Sells 1985)

To explain telescoping, Roberts (1987) suggests that the acceptability of singular anaphora in (9a,b) and (10a,b) is due to the successful construction of rhetorical relations between (9a,b) and (10a,b). However, Roberts does not provide a mechanism to account for how rhetorical relations affect the acceptability of telescoping examples.

QS and Adverbial Quantification

Although (11a,b) is predicted to be unacceptable by standard dynamic semantics, a number of similar examples in the literature such as (12a,b), which contains a quantificational adverb, are in fact felicitous. Standard dynamic semantics cannot explain the fact why adding a quantificational adverb improves the acceptability of (11) substantially.

(11) a. *A train*$_1$ leaves every hour from Boston.

b. (?)*It*$_1$ stops in New Haven.

(12) a. *A train*$_1$ leaves every hour from Boston.

b. *It*$_1$ *always (sometimes)* stops in New Haven. Sells (1985)

It has been suggested by e.g. Karttunen (1976) that the adverb in (12b) makes the singular pronoun *it* accessible to the antecedent under the QAB *every*, a notion implemented in the formal semantics of Gawron (1996). We will evaluate this claim after describing the results of our survey on examples like these in section 2.

1.2 Outline of the Paper

It is well known that the acceptability of QS examples is usually controversial. In an attempt to settle the issue of the correct data set to use, we conducted a data survey on a set of representative examples. We summarize the survey results in section 2. The results are surprising: judgments from linguistically unsophisticated native English speakers on QS examples differ from what is claimed in the literature. It turns out that many of the examples found in the literature are marginal for naive speakers. We used the examples judged acceptable by most speakers as a relatively uncontroversial set of data, which we then attempted to explain.

For a formal account, we must choose between two basic approaches. The first accepts that some logical operators, including universal determiners, are intrinsically barriers to anaphora. According to this view, a proper solution is to add extra machinery (e.g. antecedent accommodation in Roberts 1987, 1989, 1996) to extract information from under the operators in cases in which anaphora is possible. The second denies that these operators are in fact anaphora barriers, and reconstructs their semantics so that information in their scope can be released, as in Groenendijk & Stokhof (1989) and Kibble (1998). In section 3, we argue that the first approach in general over-generates in some cases, and, moreover, does not provide a powerful enough tool to deal with the problems of plural and plural quantificational subordination. In section 4, we further argue that quantificational subordination is not a completely unified phenomenon. In section 5, we adopt the second approach outlined above and in section 6 propose a formalism for determiners that can account for the release of information necessary for anaphora without making

use of any mechanisms that are not independently required. In order to make distinctions between different types of quantificational subordination, a mechanism for *information attachment* is required; in our theory, this mechanism is based on accounts of rhetorical relations in SDRT (Segmented Discourse Representation Theory; cf. Asher 1993 and Asher & Lascarides 2003). We then use the formalism of universal determiners and SDRT to explain the possibility of QS phenomena. We look at some examples in section 7. In section 8, we then tie all the strands together to show how contrasts in both felicity, and marginality, fall out of our approach. Finally, we close by discussing some implications of this approach for subordination involving modals, a line we will pursue in future work. The material we used for our data survey is presented in the appendix.

2 Results of a Data Survey

We distributed two surveys to approximately 80 students in a basic linguistics course taught by the second author. Students were offered extra credit points for their participation. Sixty surveys were returned for the first survey, and fifty nine for the second. The surveys consisted of a number of discourses: participants were asked to judge the felicity of the discourses on a four-point scale, with possible answers 'totally out', 'very weird but still possible', 'a little weird', and 'fine'. We interpreted the data obtained in this manner as follows. Discourses were judged as acceptable if 2/3 or more of the responses were for 'fine' or 'a little weird'. Discourses were judged unacceptable if 2/3 or more of responses were 'very weird but still possible' or 'totally out'. Discourses which showed no pattern in the responses were judged marginal. The results of the survey are shown in the appendix along with the examples presented.

Summarizing, three main results were obtained from the survey.

Result A: Standard QS Examples

For standard QS examples like (2) and (3a,b), we found that plural anaphors were generally preferred, when the antecedent was a universally quantified NP. We also found that rhetorical relations affect the acceptability of QS discourses. For example, according to SDRT (Asher 1993 and Asher & Lascarides 2003), the rhetorical relation between (3a) and (3b) is *Elaboration* and the rhetorical relation between (2a) and (2b) is *Result*. According to our survey data, QS discourses involving *Elaboration* are generally better than QS with other relations such as *Result*.

Result B: Telescoping

We first checked the possibility of anaphoric dependence on DPs which contain universal determiners like in the telescoping example (13).

(13) a. *Each student*$_1$ went to school. *He*$_1$ walked.

b. *Each student*$_1$ went to school. *They*$_1$ walked.

First, our survey revealed that in telescoping examples plural pronouns are preferred over singular pronouns. Second, although the literature suggests that a difference between the universal determiners *each* and *every* is expected, no significant difference was observed in our survey. This result agrees with the experiment results reported in Carminati et al. (2002).

Since every telescoping example with plural pronoun was judged acceptable, we checked whether different discourse relations result in different acceptability of telescoping examples with

singular pronouns. For example, based on SDRT's theory of rhetorical relations, the sentences in (9a,b), repeated as (14a,b), are linked by *Result* while those in (10a,b), repeated as (15a,b), are linked by *Narration*.

(14) a. *Each student*$_1$ in the syntax class was accused of cheating on the exam.
b. *He*$_1$ was reprimanded by the dean. (Fodor & Sag 1982)

(15) a. *Each degree*$_1$ candidate walked to the stage.
b. *He*$_1$ took his diploma from the dean and returned to his seat. (Sells 1985)

The survey results show that, even though no discourse relation provides an automatically acceptable discourse, the relation *Narration* facilitates telescoping better than other relations like *Background, Result,* and *Commentary*. As before, *Elaboration* discourses are also better than the others.

Result C: QS and Adverbs

We tested the effect of quantificational adverbs on QS. The participants of our study did not judge discourses including adverbs as more felicitous than similar discourses without them, i.e. (12a,b) is not obviously better than (11a,b). We conclude that quantificational adverbs do not contribute a significant effect to QS phenomena.

Other results of our survey will become clear from the rest of the paper.

3 Problems for Extraction Approaches

The majority of approaches to quantificational and modal subordination use a variety of special mechanisms to override constraints on anaphoric accessibility, such as antecedent accommodation in Roberts (1987, 1989, 1996) and Poesio & Zucchi (1992), quantification domain introduction in Gawron (1996), presupposition accommodation in Geurts (1999), and contextual dependency in Frank (1997).[6] These approaches, in addition to leaving the issue of the marginality of many QS examples unexplained, in general exhibit three problems (in addition to the power of the machinery they introduce): (a) they over-generate in certain cases, meaning that their predictions are too liberal, (b) they are not powerful enough to explain some very simple cases of anaphora, and (c) the information dependency issues related to rhetorical relations, which create much of the complexity of the QS problem, remain entirely untouched.

The explanation of quantificational (and modal) subordination in these approaches relies totally on the special mechanisms used to make otherwise inaccessible information available. We call these approaches *extraction approaches*. The felicity of discourse subordination between two informational constituents is tied to the availability of a mechanism which extracts information from the first constituent and interprets the second with respect to that information. Such a mechanism is assumed to operate in cases like (2) and (3), so that anaphora becomes possible despite assumptions about the anaphora blocking nature of the universal determiners; it is further

[6]Except for the work of Gawron and Poesio & Zucchi, who focus on QS, the other authors discussed here direct their work primarily to modal subordination rather than quantificational subordination. Roberts and Geurts claim that their approaches can be generalized to deal with QS. Frank (1997) does not say anything explicit about quantificational subordination, but her approach can be extended in a similar way.

assumed that this mechanism is fully general and applies equally to instances of quantificational, modal, and conditional subordination.

To see that these approaches are too liberal in their predictions, consider the example (2), repeated as (16), and (17).

(16) a. Every hunter that saw *a deer*$_1$ shot *it*$_1$.

b. *It*$_1$ died immediately.

(17) a. *Every hunter*$_1$ that saw *a deer*$_2$ shot *it*$_2$.

b. **He*$_1$ intended to kill *it*$_2$.

According to Roberts (1987, 1989, 1996) and Poesio & Zucchi (1992), (16a,b) receives an interpretation consistent with the conditional paraphrase *if a hunter saw a deer then he shot it and it died immediately* or simply *if a hunter shot a deer then it died immediately*. The mechanism inducing this interpretation, however, also allows the following reading of (17a,b): *if a hunter saw a deer then he intended to kill it*. According to the survey result, (16a,b) is marginal and (17a,b) is even worse than (16a,b). These accounts incorrectly predict the discourses (16a,b) and (17a,b) to be felicitous.[7] The Roberts-style theories, then, over-generate in cases like these. This problem also applies to the approach outlined in Geurts (1999) and to possible extensions of Frank (1997), since these theories, while developed differently, produce essentially similar logical representations. In order to handle this difficulty, these approaches must provide clear and detailed constraints on the mechanism of information extraction; however, despite many attempts, definitively spelling out such constraints has proved to be a non-trivial task and still remains to be done.

For Gawron (1996), (16a,b), (17a,b), and even (3a,b) are predicted to be unacceptable since no quantificational element is present in (16b) and (17b). But he predicts that (18a,b) should be acceptable, and our survey shows the opposite.

(18) a. *Every farmer*$_1$ who owns *a donkey*$_2$ beats *it*$_2$.

b. ?*He*$_1$ always treats *it*$_2$ badly.

Gawron's theory not only does not allow for good QS examples like (3a,b) but also wrongly predicts (given our survey) that quantificational adverbs can substantially facilitate QS.

Next, to see that the extra machinery approaches are not powerful enough to explain some very simple cases, consider the following example from our survey.

(19) a. Every hunter who saw *a deer*$_1$ shot *it*$_1$.

b. *They*$_1$ died immediately.

According to our survey, example (19a,b) is acceptable. But Roberts-style approaches cannot handle examples involving plurals, even such simple examples as this one.

Consider now more complex examples like the following.

[7] Even though Roberts (1996) and Poesio & Zucchi (1992) provide some constraints on antecedent accommodation, their constraints do not make (17a,b) infelicitous. The reason, perhaps, lies in the nature of their constraints, which are tied relatively closely to the particular examples which they consider.

(20) a. *Every man*$_1$ loves *a woman*$_2$.

b. *They*$_1$ send *them*$_2$/*her*$_2$ flowers.

In order to deal with QS in examples (20a,b), the semantic machinery should be able to explain, at a minimum, the following facts: if (20a) is interpreted on the $\forall\exists$ reading relevant for QS, antecedents introduced under the QAB *every* are accessible to both singular and plural pronouns. It is not obvious to us how the extra machinery theories can handle this issue. One possibility is to assume accommodation of the antecedent or presupposition by use of *plural discourse referents* as established in Kamp & Reyle (1993), but this approach faces two problems. First, as Krifka (1996) has argued, the mechanism for plural discourse referents in Kamp & Reyle (1993) is comparatively *ad hoc* and is not powerful enough to deal with some simple examples of plural anaphora. Second, there will be difficulties with discourses like (21)

(21) *Each student*$_1$ wrote *two papers*$_2$. *They*$_1$ sent *them*$_2$/**it*$_2$ to L&P.

Examples like (21) raise the question under what circumstances a plural discourse referent should be accommodated, as opposed to a singular discourse referent. This problem becomes especially acute in examples like (21), in which plural pronouns and singular pronouns are not interchangeable.[8]

The issues of QS involve another level of complexity related to rhetorical relations and information degradation. The first issue involves the relation between rhetorical relations and felicity in the QS examples. It has already been noted in Roberts (1987) that an explanation of the felicity of telescoping examples like (10), repeated as (22), should be based on the successful construction of rhetorical relations between (22a) and (22b).[9]

(22) a. *Each degree*$_1$ candidate walked to the stage.

b. *He*$_1$ took his diploma from the dean and returned to his seat. (Sells 1985)

Intuitively, the infelicity of (8a,b), repeated as (23a,b), also seems to be due to the failure to construct a proper rhetorical relation between (23a) and (23b) – that is, a relation which is capable of supporting the necessary information for QS.

(23) a. *Each student*$_1$ in the syntax class was accused of cheating on the exam.

b. **He*$_1$ had a Ph.D. in astrophysics. (Roberts 1987)

[8]A similar issue also arises in modal subordination examples involving plurals, such as the following examples. In order to deal with the following example (i),

(i) *A mosquito*$_1$ might come in every room in this house. *They*$_1$/*It*$_1$ would bite someone in the room.

(ii) *Two mosquitoes*$_1$ might come in every room in this house. *They*$_1$/**It*$_1$ would bite someone in the room.

whatever extraction machinery is assumed may accommodate the antecedent or presupposition with either a plural or singular discourse referent; either choice is felicitous. However, the accommodation of a singular discourse referent for (ii) is impossible.

[9]According to our survey, none of the telescoping examples are really acceptable. Example (10) is one of the most acceptable examples, judged significantly much better than others.

We agree with Roberts' intuition about the importance of rhetorical relations in the explanation of QS examples. However, the final story should be more complex. First, not all rhetorical relations can facilitate QS. For example, while the sentences in (9a,b), repeated as (24a,b), when analyzed in a theory like SDRT, are certainly connected by the rhetorical relation *Result*, the felicity of this example is controversial; QS researchers such as Fodor & Sag (1982) and Roberts (1987) judge this example good, but the naive informants in our survey participants find it unacceptable.

(24) a. *Each student*$_1$ in the syntax class was accused of cheating on the exam.

b. **He*$_1$ was reprimanded by the dean. (Fodor & Sag 1982)

Also, according to our survey, the discourse (3a,b), linked by the *Elaboration* relation, is much more acceptable than discourse (2a,b), linked by the *Result* relation. Accounting for this difference requires a well-developed theory of rhetorical relations, such as that found in SDRT.

Second, a naive theory of rhetorical relations cannot help us to explain the felicity of (25a,b).

(25) a. *Each student*$_1$ in the syntax class was accused of cheating on the exam.

b. *They*$_1$ had Ph.D.s in astrophysics.

Both (23a,b) and (25a,b) are linked by the *Background* relation. The only difference between (23b) and (25b) is on the plurality and singularity of pronouns. If the infelicity of (23a,b) is based on the failure of inferring a rhetorical relation between (23a) and (23b), how to explain the success of this operation in the case of (25)?

Another phenomena related to the complexity of the QS issue is the way that information degrades in discourse. According to our survey, while (26a) is acceptable, (26b) is less good as (26a), presumably because of the way the discourse is continued.

(26) a. *Every student*$_1$ wrote *a paper*$_2$. *They*$_1$ sent *it*$_2$ to a journal.

b. *Every student*$_1$ wrote *a paper*$_2$. *They*$_1$ sent *it*$_2$ to a journal. *They*$_1$ had worked very hard on *?it*$_2$.

As seen here, the availability of an antecedent to a pronoun in discourse can degrade; but it can also be rescued to some degree. The discourse (28a,b) is better than (27a,b) simply because of the presence of a floating quantifier *each* in (28b).

(27) a. *Three students*$_1$ each wrote *a paper*$_2$.

b. *They*$_1$ sent *it*$_2$ to a journal.

(28) a. *Three students*$_1$ each wrote *a paper*$_2$.

b. *They*$_1$ each sent *it*$_2$ to a journal.

It seems to be the case that the floating quantifier *each* in (28b) maintains the availability of the anaphoric antecedent, improving the felicity of the discourse.

These issues about rhetorical relations and availability degradation as they apply to the QS examples have been completely ignored up to the present in the literature. We will provide an attempt to deal with the complication in section 8. It will turn out that the complexity issue also plays a role in another poorly understood issue, the marginality of QS examples, that we discuss in section 8.3.

4 QS De-Generalized

We now describe our reanalysis of the essential problem of QS. Proponents of the first sort of approach, that discussed in the previous section, make one crucial assumption that turns out to be at the root of many of the observed problems: that universal determiners are anaphora barriers and a special information extraction mechanism is required to account for good QS examples, although the information extraction mechanism may be activated or guided by different factors. In fact, as we show below, this assumption is not correct. Examining why this is so gives substantial insight into the nature of QS and is the first step on the road to a true solution.

Let us begin by considering a case of conditional subordination.

(29) a. If *a person*$_1$ goes to school, *he*$_1$ will learn a lot of new things.

b. **He*$_1$'s a pretty knowledgeable guy.

We are interested in the reading of the conditional in (29a) on which the pronoun *he* does not refer to a particular individual, but rather is linked to the nonspecifically interpreted indefinite introduced in the antecedent. We use the term *local information* for information subsumed within the scope of a semantic operator in this manner, to bring out the idea that such information is restricted to the operator domain. As shown by the infelicity of continuing the discourse in (29), the standard dynamic formulation of conditionals as inducing this local quality on their content seems to be correct.

Now, however, let us reconsider the quantificational subordination cases. In both DPL and DRT, the interpretation of universal determiners exploits the semantics of conditionals; thus, information introduced under universal determiners turns out to be local information which cannot escape the universal domain.[10] As a result, universal determiners serve as anaphora barriers in DRT and DPL. Because of this analysis, the problem of quantificational subordination seems to be the same as the problem of making nonlocal use of local (proximate) information; the accommodation technique used in approaches of the first type functions to extract this local information from the domain of the QAB, allowing anaphoric links to it.[11]

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[10]In dynamic semantics, the conditional implementation of universal determiners is generally called internally dynamic but externally static. Groenendijk & Stokhof (1989) provide a externally dynamic notion of universal determiners to account for the QS cases. Some problems may be worth mentioning about their approach. First, as they themselves note, it is not clear when a universal determiner should be treated as externally static or externally dynamic. They suggest that the issue may be related to the discourse relation between sentences, but provide no further details. Poesio & Zucchi (1992) and Roberts (1995) take this to be an essential problem with the solution in Groenendijk & Stokhof (1989) to the QS examples. Second, even though we may be able to determine in what situations externally static and externally dynamic interpretations should be used, we still need to deal with the semantic and discourse-level differences among different universal determiners discussed above. Third, moreover, universal determiners are always externally dynamic to plural anaphora. The internal-external dynamic distinction does not really apply for universal determiners. Fourth, universal determiners and conditionals have different discourse effects. While

(i) Every student went to school. They brought lunch boxes.

(ii) If x is a student, then he went to school. They brought lunch boxes.

(i) is fine but (ii) is unacceptable.

[11]Quantificational subordination also occurs in examples which do not contain universal determiners. If we take the determiner *most* to be a QAB, the discourse (i)–(ii), similar to an example in Heim (1990), is a straightforward

However, a wider range of natural language data shows that the claim that sentences like *every student went to school* provides only proximate information about students is false, despite their conditional-based analysis within dynamic semantic frameworks. Anaphoric dependence is available relatively unrestrictedly to objects introduced by universal determiners, as in the example (20a), repeated as (30a).

(30) a. *Every man*$_1$ loves *a woman*$_2$.

b. *They*$_1$ send *them*$_2$/*her*$_2$ flowers.

From this perspective, the reason that example (10) is significantly better than other telescoping examples, is not because of the manner in which the pronouns in (10b) access the 'proximate' information in (10a), but rather because of how the information introduced by (10a) can be updated by continuing the discourse with (10b).

On our account, the problem does not lie in the nature of the extraction mechanism that accounts for anaphora into quantificational contexts, but in the kind of semantic objects that are introduced by such contexts, and in the kinds of objects can then depend on them for their meaning. The infelicity of (31), for us, is not directly caused by the QAB *each*.

(31) a. *Each degree*$_1$ candidate walked to the stage.

b. **He*$_1$ was working in a high-tech company.

The infelicity is simply that the discourse does not properly support the anaphoric accessibility, because the discourse relation that holds between the two segments (*Background*) does not easily combine with the dependency relation necessary for use of a singular pronoun. This point will be elaborated in the next section.

Note that, however, the issue of making use of proximate information seems to reappear in certain situations, for instance in the discourse (32).

(32) a. If *a person*$_1$ goes to school, *he*$_1$ will learn a lot of new things.

b. *He*$_1$ will become a pretty knowledgeable guy.[12]

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example of QS.

(i) Most books contain *a table of content*$_1$.

(ii) *It*$_1$/*They*$_1$ is/are at the end.

It is not clear in the literature whether the determiner *most* should be taken as a QAB. Our account of universal determiners in the dynamic semantic tradition as exploiting conditional semantics may not be able to be generalized to the cases containing determiners like *most*. This issue should not affect the main points in this paper.

[12] An anonymous referee points out to us that the discourse in (i) and (ii) seems to be more acceptable than (32a,b).

(i) If someone goes to school they will learn a lot of new things.

(ii) They will become a pretty knowledgable person.

The referee indicated that the plural pronoun *they* in both (i) and (ii) is used to avoid gender bias, in a context where it receives a singular interpretation. The referee also indicated the possibility that many of the survey examples in which the plural pronouns are preferred to singular pronouns may be explained by this singular usage of plural pronouns; the plural pronouns in the survey may not always be meant to be plural.

There might be some truth to this notion. The authors are unsure how far this idea can be taken. A further survey may be required to check this out. But the authors also notice that this explanation will not work in all cases.

Here, the information introduced by *a person* in (32a) truly seems to be proximate; it has no specific reading. As we can see, the only difference between (29b) and (32b) is presence of the modal *will*. Nonetheless, the antecedent information is available to the pronoun in (32b) despite its proxy status; but such is not the case for (29b). Some means of making use of proxy information seems to be needed in (32b), as well as some way of restricting access to it (for 29b).

5 Informal Elaboration of Our Approach

In the previous section we stated that, in our view, there are two crucial elements needed for a true account of quantificational subordination: an explanation of why anaphoric relations are possible in the good cases of subordination, and an explanation of why many discourses involving quantification subordination are *marginal*, or even infelicitous for many speakers. To answer the first question, we redefine the received formalism of universal determiners in order to induce the release of the correct sort of information from them.[13] Doing so, of course, means that we massively over-generate "good" discourses; we appeal to the notion of discourse coherence in use in SDRT to solve this problem. The fine-granted distinctions between rhetorical relations made in SDRT provide us with a way to identify the rhetorical relations which facilitate QS and those which block QS. The apparent marginality of QS cases we explain by utilizing a dynamic formalism which allows expression of notions of discourse processing and optionality. We will delay our discussion of the issue of marginality until section 8.3, here presenting only the first part of the story.

5.1 Universal Determiners and Modes of Processing

Our formal semantics for universal determiners follows the formalism for universal determiners in Asher & Wang (2003). To model the truth conditional and discourse effects of universal determiners, they appealed to *counting predicates* and *modes of processing* (dynamic transitions, or jumps), within the framework of dynamic semantics. Counting predicates will play an important role when we define the meaning of determiners in section 6. Basically, a determiner is defined as a complex composed of a quantificational force and a counting predicate, which is used to control the proper witness output related to the meaning of the determiner. The modes of processing can be seen as programs for controlling the processing of witnesses. We model the information dependency relations relevant to anaphora and truth-conditional semantics by using these two special features.

Let us take the DP *all students* as an example. In our formalism, this DP is represented as $\exists x; all_x(student(x))$.[14] In this formula, $\exists x$ is a quantificational force which is modelled by resetting in a way similar to that employed by Groenendijk & Stokhof (1991). The dynamic

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Consider the examples (iii) and (iv).

(iii) Every Italian loves their mothers.

(iv) *Each Italian loves their mothers.

It has been noted that (iii) is fine for the reason that the plural *their* is not really plural but used to avoid gender bias. However, this kind of gender bias avoiding usage does not work out in the example (iv) in which *each* is used.

[13]This can be viewed as a kind of generalization of the external dynamics of universal determiners in Groenendijk & Stokhof (1989).

[14]Concerning the compositionality matter, it can be written as $\lambda Q.[\exists x; all_x(student(x)); Q(x)]$ in the clause level.

conjunction (relational composition) defined in Groenendijk & Stokhof (1991) is written as ";", and $all_x(student(x))$ plays the role of controlling the proper witness output through use of the counting predicate all. The formula $\exists x; all_x(student(x))$ is roughly interpreted as the following: for information states S_F and $S_F^{'}$ which are sets of structured assignments, if $< S_F, S_F^{'} > \in [\exists x; all_x(student(x))]_M$, then the assignment functions in $S_F^{'}$ assign students to the variable x and the set of objects assigned by the assignment functions in $S_F^{'}$ consists of exactly the set of students, call them witnesses, defined in the model M. In other words, the quantificational force of the determiner introduces a discourse variable, and the counting predicate tells us how many objects should be related to this variable. Thus, the formula $all_x(\varphi)$, which makes use of the counting predicate all, returns the entire set of witnesses which satisfy $\varphi(x)$. For similar reasons, the formula $some_x(\varphi)$, where $some$ is a counting predicate, returns some of the witnesses which satisfy $\varphi(x)$; and the formula $a_x(\varphi)$, which includes the predicate a, returns one of the witnesses which satisfy $\varphi(x)$.

The semantics we provide for universal determiners is quite different from traditional dynamic semantics. For example, in DPL (Groenendijk & Stokhof 1991), universal determiners, interpreted as universal quantifiers, are universal tests, i.e. if the test succeeds then the output is the same as the input, and otherwise nothing is output. A special feature of a universal test is that the output may contain no information about the objects quantified over by the universal quantifier. On the contrary, in our semantics, the output of a translated DP is always related to the meaning of the DP by witnesses. There is no output that does not contain relevant information about the DP.

There is no difference between the witness sets introduced by the three universal determiners *all*, *every*, and *each*, for they each make use of the counting predicate all. The source of the differences among the three determiners is the manner in which they employ the witnesses they introduce, or, in other words, in how these witnesses are processed. We explicate the difference by introducing different modes of processing. In this paper, we employ three processing modes: a simple distributive mode $Dis(x)$, a dependent mode $Dep(x, y)$, and a 'strong' dependent mode $S\_Dep(x)$.[15]

For example, in (33), every determiner has a simple distributive reading. We symbolize the distributive reading through use of the distributive mode of processing $Dis(x)$. The logical forms of (33a,b, and c), when processed with the simple distributive mode, can be represented in our formalism by the formulas in (33′):

(33) a. All students went to school.

b. Every student went to school.

c. Each student went to school.

(33′) $\exists x; all_x(student(x)); Dis(x); went\_to\_school(x).$

In our formal semantics, we assume this simple distributive reading to be the default reading for universal determiners in our initial input states.

The dependent mode of processing occurs in examples like those in (34).

[15]The semantics in this paper is a natural extension of the semantics of plurals in Asher & Wang (2003). In Asher & Wang (2003), modes of processing like collective mode and cumulative modes are also provided to account for collective readings and cumulative readings.

(34) a. All students like a teacher.

b. Every student likes a teacher.

c. Each student likes a teacher.

The $\forall\exists$ reading is more obvious in (34b) and (34c) than in (34a). To model this reading, which we call the dependent reading, we allow use of the dependency mode $Dep(x, y)$ when processing the determiners *every* and *each*. We can think of the dependency mode $Dep(x, y)$ as a two place predicate which claims existence of a dependency relation between the objects assigned to the variables x and y. For example, we can represent the $\forall\exists$ reading of (34b) and (34c) as follows by exploiting existential closure.

(34′) $\exists x; \exists y; all_x(student(x)); Dep(x, y); a_y(teacher(y)); like(x, y).$

These formulas admit the interpretation that for every different student there is a teacher he likes, which is the dependent reading.[16] These mechanisms will provide a way to account for anaphoric accessibility in examples like (20a,b).[17]

The final mode of processing we use here, the strong dependent mode, models the difference in the discourse effects of the determiners *every*/*each* and *all*. An example of this difference is given in (35).

(35) a. *All men*$_1$ love *a different woman*$_2$. *They*$_1$/**He*$_1$ send(s) *her*$_2$ flowers.

b. *Each/Every man*$_1$ loves *a different woman*$_2$. *They*$_1$/*?He*$_1$ send(s) *her*$_2$ flowers.

The use of plural pronouns in (35a,b) is acceptable for many speakers. However, according to our survey, use of a singular pronoun is more appropriate in (35b) than in (35a). In our formal semantics, the acceptability of the plural pronouns in (35a,b) can be modelled by use of the dependency mode, but to capture the difference in the acceptability of singular pronouns in (35a,b), we make use of the strong dependent mode, $S\_Dep(x, y)$. This mode is able to apply in the case of *each* and *every*, but is not usually available with *all*.

The following QS examples exhibit a distinction which we take to be similar.

(36) a. *All*$_1$ degree candidates walked to the stage. ***He***$_1$ took his diploma from the dean and returned to his seat.

b. *Each/Every degree candidate*$_1$ walked to the stage. *He*$_1$ took his diploma from the dean and returned to his seat.

According to our survey, (36b) is only a little better than marginal; but (36a) is even worse. Just as with the dependent mode, the strong dependent mode maintains a dependency relation; but it also creates a way to produce a witness which is accessible to singular pronouns. The strong dependent mode $S\_Dep(x, y)$ is able to create a dependency relation not only for y on x, but also for x on x itself. In cases like (36b), the strong dependent mode produces a *reflexive* dependency

[16]This mechanism will provide us a way to account for scoping *in situ*. See Asher & Wang (2003) for more detail.

[17]In fact, there already is an antecedent for this dependency interpretation of different readings for (34b) and (34c) in the literature by quantifier elimination using Skolem functions. For example, the logical formula $\forall x\exists xFxy$ can be Skolemized by the formula $\forall xFxf(x)$ for some function f.

on x, $S\_Dep(x, x)$, since there is no other object introduced on which a dependency relation can be produced. Note that we do not allow the dependent mode to be reflexive, i.e. $Dep(x, x)$ is ill-formed. It should also be noted that the semantic difference between the dependent and strong dependent modes is not truth-conditional, but is simply a difference in discourse effects.[18]

Different modes of processing make the information released from universal determiners sensitive to the usage of singular or plural pronouns, and by doing so, produce different environments for information dependency in subsequent discourse. We will explicate the formal details of how this sensitivity is possible in section 6. For clarity, we here summarize in the table below the modes of processing or dependency relations each determiner makes available.

Determiner	Dependency Relations		
	Dis	Dep	S_Dep
all	$\surd$	$(?\surd)$	
every	$\surd$	$\surd$	$\surd$
each	$\surd$	$\surd$	$\surd$

Note that though the mode Dep is marginal for the determiner *all*, it is still available. The option chosen will depend on the preferences and tendencies of a given speaker. In this sense, the choice modes of processing in real sentence interpretation is pragmatic in nature.[19]

We are assuming that different modes of processing do create ambiguity rather than underspecification for universal determiners.[20] In section 6 we will also introduce the predicates $singular$ and $plural$ into our logic. They will be used to check the number agreement of singular and plural pronouns with their antecedents.

5.1.1 Linguistic Evidence for Modes of Processing

In certain languages, there is direct linguistic evidence for the modes of processing we postulate. In this paper, we present some facts from Chinese, Japanese, and Hungarian which support the dependent and strong dependent mode of processing. Consider first the Chinese example (37).

(37) a. *mei-yi-ge* *xue-sheng* *xi-huan* *yi-ge* *lao-shi.*
every-one-classifier student like one-classifier teacher
'Every student likes a teacher.'

b. *mei-yi-ge* *xue-sheng* *ge* *xi-huan* *yi-ge* *lao-shi.*
every-one-classifier student each like one-classifier teacher
'Each student likes a teacher.'

Both the $\forall\exists$ reading and the $\exists\forall$ reading are possible for (37a) but only the $\forall\exists$ reading is possible for (37b). The word *ge* in example (37b) forces the dependent reading of the 'indefinite'. We can simply interpret *ge* as a lexical expression which induces obligatorily the dependent mode of

[18] In section 6, we will see that the strong dependent mode is definable by the dependent mode. But from a linguistic viewpoint, it is still important to separate them.

[19] Originally, we, like many others, believed that there must be some substantial difference between *every* and *each*. What we suspected is that the strong dependent mode is in general available to *each* but not usually available to *every*. However, according to the survey results, there is no such difference. This is an unexpected result.

[20] See Asher & Wang (2003) for a more detailed argument.

processing. Note that without *ge* the dependent mode of processing is still a possible choice in processing the sentence (37a). The role of *ge* in Chinese can be thought of as similar to the role of floating *each* in English.[21]

In English, the sentence "Every student likes a different teacher" has to be interpreted on the $\forall\exists$ reading (aka the dependent reading) in order to make sense of it. In Chinese, without the presence of *ge* to force the dependent mode, (38a) is marginal. With *ge*, however, as in (38b), it becomes fine.

(38) a. ?*mei-yi-ge* *xue-sheng* *xi-huan* *yi-ge* *bu-tong-di* *lao-shi.*
every student like one-classifier different teacher
'Every student likes a different teacher.'

b. *mei-yi-ge* *xue-sheng* *ge* *xi-huan* *yi-ge* *bu-tong-di* *lao-shi.*
every student each like one-classifier different teacher
'Every student likes a different teacher.'

The Chinese *ge* also sometimes introduces the strong dependent mode. In example (39), *ge*, used in combination with the *explicit* reflexive pronoun *zi*, represents the strong dependent mode structurally. We can represent this in our framework as $S\_Dep(x, x)$.

(39) *mei-yi-ge* *xue-sheng* *ge-zi* *shui-le.*
every student each-self sleep-aspect
'Each student slept.'

The Chinese data about *ge* also shows interesting phenomena relating to information degradation rescue like (28a,b). Consider (40).

(40) a. *mei-yi-ge* *xue-sheng* *ge* *xi-huan* *yi-ge* *lao-shi.*
every-one-classifier student each like one-classifier teacher
'Each student likes a teacher.' (only $\forall\exists$)

b. *ta men* *ge* *song* *ta/*ta-men* *yi-fen* *li-wu.*
they each send her/*them one-classifier present
'They each send her a present.'

If *ge* appears in (40b), then the discourse (40a,b) is acceptable if the singular pronoun *ta* is used but unacceptable if the plural pronoun *ta-men* is used. However, in discourse (41a,b), without using *ge* in (41b), neither the singular pronoun nor the plural pronoun is very good.

(41) a. *mei-yi-ge* *xue-sheng* *ge* *xi-huan* *yi-ge* *lao-shi.*
every-one-classifier student each like one-classifier teacher
'Each student likes a teacher.' (only $\forall\exists$)

b. *ta men* *song* ?*ta/*ta-men* *yi-fen* *li-wu.*
they send ?her/*them one-classifier present
'They send her a present.'

[21] In English, the sentence "Every student each likes a teacher" is ungrammatical. This might indicate that the dependent mode is already present in the determiner *every*, making *each* unnecessary.

These data suggest that a continuation with *ge* is required to halt the information degradation and then sustain the anaphoric relation.

In Hungarian, as argued in Farkas (1997), the dependent reading is marked by determiner reduplication, *D-reduplication* for short. For example, (42a) unambiguously has only the ∀∃ reading but (42b) is ambiguous.

(42) a. *Minden gyerek olvasott egy-egy konyvet.* (Farkas 1997)
every child read a-a book-ACC
'Every child read a book.'

b. *Minden gyerek olvasott egy konyvet.* (Farkas 1997)
every child read a book-ACC
'Every child read a book.'

The second feature of Hungarian D-reduplication is that there must be something to fill in the dependency relation. In other words, the dependency relation must be relational. As a result, the following sentence is infelicitous, as it lacks anything capable of carrying out this function.

(43) **Het-het gyerek szalad.* (Farkas 1997)
seven-seven child runs
'Seven children are running.'

The third feature is that *ki-ki* ('who-who') in Hungarian must get a dependent reading, and is incompatible with a simple distributive reading.

(44) a. *Ki-ki leult egy-egy szekre.* (Farkas 1997)
who-who sat-down a-a chair
'Everybody sat down on a chair.'

b. **Ki-ki leult.* (Farkas 1997)
who-who sat-down
'Everybody sat down.'

Evidence for modes of processing can also be found in Japanese.[22] Japanese has a number of ways to express universal determiners: the one we discuss here is *kaku*, written with the same character as Chinese *ge* above. In example (45a), as with the Chinese example (38), when the sentence is produced without the use of the floating quantifier *sorezore*, the sentence is marginal.[23]

(45) a. ?*kaku gakusei-ga chigau sensei-ga suki da.*
each student-NOM different teacher-NOM like COP
'Each student likes a different teacher.'

b. *kaku gakusei-ga sorezore chigau sensei-ga suki da*
each student-NOM that-that different teacher-NOM like COP
'Each student likes a different teacher.'

[22]Thanks to Norihiro Ogata for help with the Japanese evidence.

[23]An interesting complication here is that when the DP *kaku gakusei* is used with the topic-marking particle *-wa* rather than nominative *-ga*, the sentence also becomes fine. It may be that *-wa* has the ability to induce a dependent reading itself. We will not discuss this issue further in the present paper.

The evidence from these three languages clearly shows the existence of the dependent mode of processing.[24] Note that while all of these languages explicitly mark the dependent and strong dependent mode, they also have expressions that exhibit an ambiguity between the dependent mode and the distributive mode, just as English determiners do. It is interesting to speculate on whether there are languages which require a choice between modes in all instances, that is, whether certain languages lack ambiguous determiners of this sort entirely. Our guess is that there are not, but this is a matter that requires further empirical work.[25]

5.2 The Necessity of Integrating A Rich Notion of Discourse Structure

Rhetorical relations play two essential roles in our explanation of QS. First, it is necessary to check whether any rhetorical relation can be inferred between two discourse constituents at all; if not, QS will be infelicitous in the sense that the discourse would be infelicitous regardless of the facts about anaphora. More importantly for our account, it is possible to make a distinction between rhetorical relations that are capable of supporting the kind of information dependency needed for QS and relations that are not. Our survey indicates that the only relation with the former property is *Elaboration*; although *Narration* discourses are better than others, they are still rather marginal. Essentially, then, our account involves the following three parts: (i) check whether the determiner allows release of the proper witness set for the following pronoun (discussed in section 5.1), (ii) check whether any rhetorical relation can be inferred, and, crucially, (iii) check whether the inferred relation is capable of supporting QS. Failure at any of these steps causes the discourse to become infelicitous.[26]

In SDRT terms, an incoherent discourse is understood as a discourse in which there is a discourse constituent or speech act (which here we can just consider as an instance of a proposition in a discourse) that does not seem to be connected in any meaningful way to the rest of the discourse (paraphrased from Asher & Lascarides 2003:4). The following is another example of an incoherent discourse.

(46) a. John arrived in Edinburgh by train. (Asher & Lascarides 2003)

b. ??Max's hair was black.

The infelicity of (46a,b) can be simply explained by discourse incoherence; it's not obvious how the two speech acts conveyed by these two sentences are meant to be connected, and so the discourse makes no sense as a whole.

We will not go into much detail here about how rhetorical relations can be computed and inferred, but instead refer our readers to Asher (1993) and Asher & Lascarides (2003) for details. The essence of the idea, however, is that a variety of information sources, including lexical semantics and domain knowledge, determines what relations, if any, can be computed between discourse-level propositions; given the right world knowledge and (relevant parts of) the semantic information contained in the speech acts at issue, speakers are able to infer how these speech acts

[24]For more linguistic evidence readers may check German distributivity marker *je* (Link 1998) and the Korean distributivity marker *siik* (Choe 1987).

[25]Another question for future research is whether the presence of overt markers of dependency relations varies systematically with other elements of the semantic system of the language; this question, too, we must put aside for the moment.

[26]We present the analysis algorithmically for expository purposes. In fact, it is fully declarative.

are connected. In SDRT, the particular connections inferred to hold between speech acts also affect the semantic interpretation of the discourse; for instance, if the relation $narration(\pi_1, \pi_2)$, is inferred, where π marks a speech act, then it will be a logical consequence of the discourse that the event described by π_1 takes place before the event described by π_2.

In these terms, a discourse failing at condition (ii) will be one in which the two discourse constituents have no discernible connection at all. This situation will ordinarily not arise in cases of QS, because in the general case the presence of an anaphoric pronoun is enough to signal that a connection is intended with another constituent in the discourse. The following variation of the discourse above is as close as we can come:

(47) a. *Every male student*$_1$ arrived in Edinburgh by train.

b. ??!*His*$_1$ *hair* was black.

Nevertheless, we should note that an example like (47a,b) immediately becomes acceptable when we substitute the plural pronoun for the singular one in (46b). Thus, it appears that the problem is that some discourse connections cannot be established when a dependent mode of processing is required. In fact, this case may not be very different from the cases that clause (iii) is designed to deal with, a clause to which we now turn.

Clause (iii) accounts for examples like the following, the infelicity of which we stated in section 4 to be related to rhetorical relations.

(48) a. *Each degree*$_1$ candidate walked to the stage.

b. **He*$_1$ was working in a high-tech company.

On our account, the universal determiner *each* is not a QAB, and does license a witness for the singular pronoun in (48b) through the use of the strong dependent mode. We propose that the reason for the infelicity of (48) should not be directly related to the failure of the anaphoric link, but should be accounted for by the inability of the discourse relation between the two constituents, here *Background*, to license the continuation properly in a sense to be clarified below.

Another instance is the following. We stated above that, according to our survey, the example (10), repeated as (49), is more acceptable than other telescoping examples.

(49) a. *Each degree*$_1$ candidate walked to the stage. (Sells 1985)

b. ?*He*$_1$ took his diploma from the dean and returned to his seat.

We showed above that the universal determiner does not block anaphoric dependence of the singular pronoun in (49b) on the content of that DP. It is also possible to infer the *Narration* rhetorical relation from (49a,b), given world knowledge about how graduation ceremonies proceed. With these facts, the logical form for the discourse (49) will be roughly like the following:

(49′) $\pi_1 : each_x(degree\_candidate(x); walked(x));$
$\pi_2 : took\_and\_returned(x); Narration(\pi_1, \pi_2)$

Note that when we say that universal determiners do not block anaphoric links to pronouns, we do not intend to say that the witnesses introduced under universal determiners are always accessible to pronouns. Whether the witnesses are accessible depends not only on whether proper witnesses are released but also on (a) whether a meaningful rhetorical relation can be deduced and (b) whether the deduced rhetorical relation can facilitate QS. Later in the paper (in section 7) we will see how this works out in more detail. And a more detailed elaboration of the construction of rhetorical relations is required to account for the complexity of QS mentioned in section 3. We will explain more about the issue in section 8.

6 Formal Semantics

The semantics we provide here is based on augmented dynamic predicate logic (DPL$^+$) proposed in Asher & Wang (2003), which is an extension of DPL.[27] In DPL$^+$, the language of DPL is expanded to include information about different sorts of counting predicates, which provide witnesses for certain situations, and modes of processing, which function to process witnesses in particular ways.

Definition 1 Language of DPL$^+$

1. Logical Symbols

   The usual DPL logical symbols (including variables, connectives ($\neg$, ;) and quantifier $\exists$).

2. Non-Logical Symbols

   (a) The Usual Predicate Symbols

   (b) Transition Predicates: j^{Dep} and j^{S_Dep} (of arity 2), and j^{Dis} (of arity 1)

   (c) Counting Predicates: all, $some$, a, one, two, $three$, $\ldots$, $many$, $most$, $\ldots$[28]

Definition 2 Syntax of DPL$^+$

1. $P(t_1, \ldots, t_n)$ is an atomic formula, in which t_i is a term and P an n-ary predicate.

2. The usual DPL clauses for formulas involving ;, $\neg$, and $\exists$.

3. For any counting predicates D, such as *all, n, the, a, and some,* $D_{t_i}(\varphi)$ is a formula if φ is a formula and t_i is an variable.

The syntax of DPL$^+$ is similar to DPL, excluding formulas which represent information about modes of processing and the counting predicate formulas.

A model for the language of DPL$^+$ is defined by a pair, $M =< D, I >$, where D is a non-empty set of objects and I is an interpretation function. For a constant c_j, $I(c_j) \in D$. For a n-place predicate P^n, $I(P^n) \subseteq D^n$. For an assignment function g, $g : (V \cup C) \rightarrow D$, where V is the set of variables, C is the set of constants, and $g(c_i) = I(c_i)$. An information state $S_F = \{< g, f_g > \mid g \in S \text{ and } S \subseteq \$\}$, in which $\$$ is the set of assignment functions, and

[27] DPL$^+$ has considerably more expressive power than DPL or first order logic, although it does not have the expressive power of full second order logic since we don't quantify directly over arbitrary sets of objects in the domain.

[28] This set of counting predicates is richer than we strictly speaking need for this paper.

$f_g : V \rightarrow (\$ \cup \wp(\$)) \times D$. The function f_g, defined such that if $f_g(t_i) = (A, B)$, then $g \in A$, is a function which records dependency and assignment information on assignments. We will make use of this function in defining the semantics of transition operations. The projection function $\mu^{1,2}$ yields either the first or the second element of the pairs that make up $f_g(t_i)$. $\mu^1(f_g(t_i))$ partitions the set of assignments according to how many objects are assigned to x by assignments in a given information state, while $\mu^2(f_g(t_i))$ is the actual assignment to x by the pair $< g, f_g >$ in the information state.

The collection function δ collects the values assigned to a variable t_i by an element in the partition on assignments given by $\mu^1(f_{g_j}(t_i)))$ and is defined as follows: $\delta(\mu^1(f_{g_j}(t_i))) = \{g_h(t_i) | g_h \in \mu^1(f_{g_j}(t_i))\}$. The interpretation of formulas $[.]_M$ is a function that $[\varphi]_M \subseteq \$_F \times \$_F$, where $\$_F$ is the set of information states.[29] For any information state S_F, $S = \{g| < g, f_g > \in S_F\}$ and $F = \{f_g| < g, f_g > \in S_F\}$. The initial input information state S_F must satisfy the following two constraints: (i) for any g_j and t_i, $\mu^1(f_{g_j}(t_i)) = S$, and (ii) for any g_j and t_i, $\mu^2(f_{g_j}(t_i)) = g_j(t_i)$. These two constraints cause the distributive mode to be the default processing mode. In definition 3, we give the semantics for the transition or jump formulas.

Below we detail the semantics of the atomic formulas, which for us include not only standard DPL formulas but also those transition formulas (modes of processing) that have an effect on how assignments are structured and what variables in fact get assigned in information states.

Definition 3 Semantics for Atomic Formulas of DPL$^+$

1. $S_F[P(t_1, t_2, \ldots, t_n)]_M S'_F := S_F = S'_F$,
   and for any $g_j \in S'$, $< \mu^2(f'_{g_j}(t_1)) \ , \ldots , \mu^2(f'_{g_j}(t_n)) > \in P^M$.

2. $S_F[j^{Dep}(t_i, t_h)]_M S'_{F'} :=$

   (a) $S = S'$,

   (b) for any $g_j \in S'$ and t_k, $\mu^2(f'_{g_j}(t_k)) = \mu^2(f_{g_j}(t_k))$, and

   (c) for any $g_j \in S'$, $\mu^1(f'_{g_j}(t_h)) = \{g_m|\ g_m(t_i) = g_j(t_i)$ and
   $g_m \in \mu^1(f_{g_j}(t_h))\}$, and for any t_k such that $t_k \neq t_h$, $\mu^1(f'_{g_j}(t_k)) = \mu^1(f_{g_j}(t_k))$.

3. $S_F[j^{S-Dep}(t_i, t_j)]_M S'_F :=$

   (a) $S = S'$,

   (b) for any $g_j \in S'$ and t_k, $\mu^2(f'_{g_j}(t_k)) = \mu^2(f_{g_j}(t_k))$, and

   (c) for any $g_j \in S'$ and $t_k = t_i$ or t_j, $\mu^1(f'_{g_j}(t_k))) = \{g_h|\ g_h(t_i) = g_j(t_i)$ and
   $g_h \in \mu^1(f_{g_j}(t_k)))\}$, and for $t_k \neq t_i$ or t_j, $\mu^1(f'_{g_j}(t_k))) = \mu^1(f_{g_j}(t_k)))$.

4. $S_F[j^{Dis}(t_i)]_M S'_F :=$

   (a) $S = S'$,

   (b) for any $g_j \in S'$, $\mu^2(f'_{g_j}(t_i)) = g_j(t_i)$, and for any $t_k \neq t_i$, $\mu^2(f'_{g_j}(t_k)) = \mu^2(f_{g_j}(t_k))$, and

[29] For a specific formula, its interpretation is a relation rather than a function since the existential quantifier is defined as non-deterministic rather than deterministic.

(c) for any $g_j \in S'$, $\mu^1(f'_{g_j}(t_i)) = S'$, and for any $t_k \neq t_i$, $\mu^1(f'_{g_j}(t_k)) = \mu^1(f_{g_j}(t_k))$.

5. $S_F[\exists t_i]_M S'_F := S =_{t_i} S'$, i.e. for any $g_j \in S$, there is an $g'_k \in S'$ that $g_j =_{t_i} g'_k$ and for any $g'_k \in S'$, there is $g_j \in S$ that $g_j =_{t_i} g'_k$. And for any t_j and $g \in S'$, $\mu^1(f_g(t_j)) = S'$ and $\mu^2(f_g(t_j)) = g(t_j)$.

6. $S_F[t_i]_M S'_F := S_F = S'_F$.

Note that transition formulas, though atomic, are *not* simple tests, but transform the structure of the output assignments.

We now tackle the recursive rules for complex formulas. We provide the details of the semantics of the counting formulas, which occur either in the presupposed or in the asserted part of a determiner's lexical semantics, as these are special to our approach and affect anaphora.

Definition 4 Semantics for Complex Formulas of DPL$^+$

1. $S_F[\varphi;\psi]_M S'_F := \exists S_{F''}$, $S_F[\varphi]_M S''_F$ and $S''_F[\psi]_M S'_F$.

2. $S_F[\neg\varphi]_M S'_F := S = S_{F'}$, $\neg\exists S_{F''}$, $S_F[\varphi]_M S''_F$

3. $S_F[some_{t_i}(\varphi)]_M S'_F := S_F[\varphi]_M S'_F$, and for any $g_j \in S'$, $|\delta(\mu^1(f'_{g_j}(t_i))| \geq 1$.

4. $S_F[a_{t_i}(\varphi)]_M S'_F := S_F[\varphi]_M S'_F$, and for any $g_j \in S'$, $|\delta(\mu^1(f'_{g_j}(t_i))| = 1$.

5. $S_F[n_{t_i}(\varphi)]_M S'_F := S_F[\varphi]_M S'_F$, and for any $g_j \in S'$, $|\delta(\mu^1(f'_{g_j}(t_i))| = n$.

6. $S_F[all_{t_i}(\varphi)]_M S'_F := S_F[\varphi]_M S'_F$, and for any $g_j \in S'$, $\delta(\mu^1(f'_{g_j}(t_i))) = \varphi^M(t_i)$, in which $\varphi^M(t_i) = \{g_i(t_i) | g_i \in S$ and $S_F \in \{S'_F | \exists S_F, S_F[\varphi]_M S'_F\}\}$.

7. $S_F[most_{t_i}(\varphi)]_M S'_F := S_F[\varphi]_M S'_F$, and for any $g_j \in S'$, $|\delta(\mu^1(f'_{g_j}(t_i))| \geq |\varphi^M(t_i) - \delta(\mu^1(f'_{g_j}(t_i))|$.

8. $S_F[more\_than\_n_{t_i}(\varphi)]_M S'_F := S_F[\varphi]_M S'_F$, and for any $g_j \in S'$, $|\delta(\mu^1(f'_{g_j}(t_i)))| > n$.

9. $S_F[at\_least\_n_{t_i}(\varphi)]_M S'_F := S_F[\varphi]_M S'_F$, and for any $g_j \in S'$, $|\delta(\mu^1(f'_{g_j}(t_i)))| \geq n$.

10. $S_F[the_{t_i}(\varphi)]_M S'_F := S_F[all_{t_i}(\varphi)]_M S'_F$, and for any $g_j \in S'$, $|\delta(\mu^1(f'_{g_j}(t_i))| = 1$.

The definitions of satisfaction, truth, consequence, and validity follow the definitions in DPL in Groenendijk & Stokhof (1991).

Definition 5 Satisfaction. φ is satisfied with respect to M, S_F written by $M, S_F \models \varphi$ iff $\exists S'_F$ such that $S_F[\varphi]_M S'_F$.

Definition 6 Truth. φ is true with respect to M written by $M \models \varphi$ iff for any S_F $M, S_F \models \varphi$.

Definition 7 Consequence. $\varphi \models \psi := \forall M, S_F, S'_F$, if $S_F[\varphi]_M S'_F$ then $\exists S''_F$, that $S'_F[\psi]_M S''_F$.

Definition 8 Validity. $\models \varphi := \forall M, S_F, \exists S'_F$, $S_F[\varphi]_M S'_F$.

Definition 9 provides a naive semantic definition for number features of pronoun (*pronoun numbers* in short). This definition should be compared to the definitions in Krifka (1996); van den Berg (1996), and Asher & Wang (2003).

Definition 9 $S_F[singular(t_i)]_M S'_F := S_F[one_{t_i}(t_i)]_M S'_F$.[30]

For number agreement with plural pronouns, a possible naive semantic definition is given in definition 10, which was suggested by Krifka (1996), or in definition 11 suggested by Asher & Wang (2003).

Definition 10 $S_F[plural(t_i)]_M S'_F := S_F[more\_than\_one_{t_i}(t_i)]_M S'_F$.

Definition 11 $S_F[plural(t_i)]_M S'_F := S_F[at\_least\_one_{t_i}(t_i)]_M S'_F$.

Neither the combination of definition 9 and 10 nor the combination of definition 9 and 11 provides a correct account of pronoun number. The examples (50a) and (50b) are direct counterexamples to definition 9, 10, and 11.

(50) a. *Mary*$_1$ wrote *one or two articles*$_2$. *She*$_1$ sent *them*$_2$/**it*$_2$ to L&P. (Krifka 1996)

b. *Mary*$_1$ wrote *an article*$_2$. *She*$_1$ sent **them*$_2$ to L&P. (Krifka 1996)

Any model in which Mary wrote only one article will make the plural pronoun in (50a) unacceptable on definition 10 and make the singular pronoun in (50a) acceptable by definition 9. Both of these two consequences are unwelcome. Adopting definition 11 will also cause problems in making (50b) acceptable.

These problems made Krifka give up a semantic account of pronoun numbers, using instead a syntactic account of number agreement for pronoun numbers. However, we take a different direction. We think that the problem with the definitions 9, 10, and 11 is that they take semantic number agreement of pronouns to be a purely extensional phenomenon. We instead analyze the semantic number of pronouns as an (epistemic) intensional concept, i.e. pronominal number features as epistemic modals. To model the intensional notion of pronoun numbers, we introduce an intensional version of DPL$^+$ (IDPL$^+$).

Definition 12 IDPL$^+$

1. *Syntax and Model:* IDPL$^+$ has the same syntax as DPL$^+$ and builds an intensional semantics on top of the extensional model theory for DPL$^+$. A model M for IDPL$^+$ is a first-order intensional model without the accessibility relations, i.e. $M =< W, D, I >$ in which W is a set of possible worlds, D is a set of objects, and I is an interpretation function which assignment interpretation for predicates.

2. *Quasi-IDPL$^+$ Interpretation*: $[.]^q_M$ is an interpretation function that $[\varphi]^g_M \subseteq (W \times \$_F) \times (W \times \$_F)$ in which W is the set of possible worlds and $\$_F$ is the set of DPL$^+$ like information states. For any information state (w, S_F) and (w^1, S^1_F),

   - $(w, S_F)[\varphi]^q_M(w^1, S^1_F) := w = w^1$ and $S_F[\varphi]^q_M S^1_F$ in DPL$^+$ fashion, e.g. $(w, S_F)[P(t_1, t_2, \ldots, t_n)]^q_M(w_1, S^1_F) := w = w_1, S_F = S^1_F$, and for any $g_j \in S^1$, $< \mu^2(f^1_{g_j}(t_1)) , \ldots , \mu^2(f^1_{g_j}(t_n)) > \in I(w_1, P)$.

[30] For any variable t_i, $S_F[t_i]_M S_F$ for any information state S_F.

3. *IDPL$^+$ Interpretation*: An information state σ in IDPL$^+$ is a subset of $W \times \$_F$ in which W is the set of possible world and $\$_F$ is the set of DPL$^+$ like information state. An interpretation of IDPL$^+$ formula φ is a function $[.]_M$ that $[\varphi]_M \subseteq \wp(W \times \$_F) \times \wp(W \times \$_F)$. For any information state σ and σ_1, $\sigma[\varphi]_M\sigma_1 :=$

   (a) For any $\kappa \in \sigma$, $\exists \kappa_1 \in \sigma_1$ that $\kappa[\varphi]^q_M\kappa_1$, and

   (b) For any $\kappa_1 \in \sigma_1$, $\exists \kappa \in \sigma$ that $\kappa[\varphi]^q_M\kappa_1$.[31]

The definition of satisfaction, truth, consequence, and validity in IDPL$^+$ is similar to DPL$^+$. The semantics of pronoun numbers are defined in definition 13.

Definition 13 Intensional Semantics for Pronoun Numbers.

1. $\sigma[singular(t_i)]_M\sigma_1 := \sigma = \sigma_1$ and $\forall \kappa \in \sigma$, $\kappa[one_{t_i}(t_i)]^q_M\kappa$, i.e. $\sigma[one_{t_i}(t_i)]_M\sigma_1$.

2. $\sigma[plural(t_i)]_M\sigma_1 := \sigma = \sigma_1$ and $\exists \kappa \in \sigma$, $\kappa[more\_than\_one_{t_i}(t_i)]^q_M\kappa$.[32]

Using definitions 13, the problem from (50) can be easily solved. The following facts justify that our semantics are adequate to account for (50).

Fact 1 Facts to Account for (50)

1. For any M, if $\sigma[\exists x; a_x(article(x)); wrote(mary, x)]_M\sigma_1$ then $\sigma_1[plural_{t_i}(t_i)]_M = \varnothing$.

2. Assume $one\_or\_two_x(\varphi)$ is defined as $one_x(\varphi) \vee two_x(\varphi)$. In order to make sense of the accessibility of plural pronouns in (50a), we introduce the idea of *intensional presupposition* for the interpretation of $one\_or\_two_x(\varphi)$: the disjunction *or* introduces genuine (epistemic) alternative possibilities. According to this intensional presupposition, for any M, if $\sigma[\exists x; one\_or\_two_x(article(x)); wrote(mary, x)]_M\sigma_1$, then

   - $\exists \kappa \in \sigma \& \exists \kappa_1 \in \sigma_1$ that $\kappa[one_{t_i}(\varphi)]^q_M\kappa_1$ and $\exists \kappa \in \sigma \& \exists \kappa_1 \in \sigma_1$ that $\kappa[two_{t_i}(\varphi)]^q_M\kappa_1$

   so $\sigma_1[plural_{t_i}(t_i)]_M\sigma_1$ and $\sigma_1[singular_{t_i}(t_i)]_M = \varnothing$.

The failure of satisfying intensional presupposition does not necessary fail the semantic evaluation, but will fail predicates which require the intensional presupposition. On the other hand, in the world w that Mary wrote exactly one article, the sentence *Mary wrote exactly one or two articles* is true in w, it does not follow that the plural pronoun in (50a) cannot be satisfied, because it does not rule out the possibility that Mary wrote more than one article. Here we see that the intensional presupposition does not directly affect truth evaluation, but rather in a sense introduces a requirement to satisfy the intensional notion of number features of pronouns in terms of the intensional model.

The following facts follow directly from definition 13.

[31]This definition applies to all formulas except mentioned specifically in the following.

[32]The plural predicate can be understood as the epistemic model formula $\Diamond more\_than\_one_{t_i}(t_i)$ defined in the sense of Veltman (1996).

Fact 2 Some Facts about Pronoun Numbers

1. $\forall\ \sigma$ and σ', if $\sigma[one_x(x)]_M\sigma'$, then $\sigma'[singular(x)]_M\sigma'$.[33]
2. $\forall\ \sigma$ and σ', if $\sigma[one_x(x)]_M\sigma'$, then $\sigma'[plural(x)]_M = \varnothing$.
3. $\forall\ \sigma$ and σ', if $\sigma[two_x(x)]_M\sigma'$, then $\sigma'[singular(x)]_M = \varnothing$.
4. $\forall\ \sigma$ and σ', if $\sigma[two_x(x)]_M\sigma'$, then $\sigma'[plural(x)]_M\sigma'$.

In order to make universal determiner phrases like *every student* accessible to plural pronouns like *they*, again, we assume an *intensional presupposition* for universal determiners: universal determiners presuppose the *possibility* that there are at least 2 objects denoted by the restrictor in the intended information state.[34]

We translate natural language determiners into DPL$^+$ formulas by making use of the DPL$^+$ counting predicates. For example, we interpret (in an approximate way) the following determiners in subject position by the combination of a quantifier meaning and a determiner meaning: ***a student*** as $\exists x; a_x(student(x))$; ***some students*** as $\exists x; some_x(student(x))$; ***all students*** as $\exists x; all_x(student(x))$; ***every/each student*** as $\exists x;\ all_x(student(x))$, $\exists x; all_x(student(x)); j^{Dep}(x, ?)$, or $\exists x; all_x(student(x)); j^{S-Dep}(x, ?)$. The symbol "?" is underspecified and will be instantiated to variables and filled in during the compositional process.

The following provides an example to introduce the formal semantics. Consider (51a), which has the logical form (51b). The semantic processing of this example can be represented as (51c).

(51) a. *Every man*$_1$ loves *a woman*$_2$. *They*$_1$ send *her*$_2$ flowers.

b. $\exists x; \exists y; all_x(man(x)); j^{Dep}(x, y); a_y(woman(y)); love(x, y); plural(x); singular(y); send(x, y)$

c. $\{(w_1, S_F^1)\} \xrightarrow{\exists x} \{(w_2, S_F^2)\} \xrightarrow{\exists y} \{(w_3, S_F^3)\} \xrightarrow{all_x(man(x))} \{(w_4, S_F^4)\} \xrightarrow{j^{Dep(x,y)}} \{(w_5, S_F^5)\} \xrightarrow{a_y(woman(y))} \{(w_6, S_F^6)\} \xrightarrow{love(x,y)} \{(w_7, S_F^7)\} \xrightarrow{plural(x)} \{(w_8, S_F^8)\} \xrightarrow{singular(y)} \{(w_9, S_F^9)\} \xrightarrow{snd(x,y)} \{(w_{10}, S_F^{10})\}$

Assume that in the input information (w, S_F^1), $S^1 = \{g_1^1, g_2^1, g_3^1\}$.[35] Since distributive mode is the default, so the following is true for the input information state. For any variable t_i,

- $\mu^1(f_{g_1^1}(t_i)) = \mu^1(f_{g_2^1}(t_i)) = \mu^1(f_{g_3^1}(t_i)) = \{g_1^1, g_2^1, g_3^1\}$
- $\mu^2(f_{g_1^1}(t_i)) = g_1^1(t_i)$, $\mu^2(f_{g_2^1}(t_i)) = g_2^1(t_i)$, and $\mu^2(f_{g_3^1}(t_i)) = g_3^1(t_i)$

The semantic evaluation of (51c) is detailed as follows. For simplicity, the information in the information state not directly affected by interpretation of the following example is considered unchanged in the process of semantic interpretation.

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[33]This formula does not imply that singular pronouns have an "exactly one" presupposition.

[34]In case that we have a singleton information state which assigns only one object for N of *every N*, the intensional presupposition fails. For more detail about the intensional semantics for pronoun numbers and intensional presuppositions for determiners, see Wang & Asher (2004).

[35]In the following elaboration, we drop the set notation when doing so will not cause confusion.

1. $(w_1, S_F^1) \xrightarrow{\exists x} \{(w_2, S_F^2)\}$
   (a) $w_1 = w_2$,
   (b) $S^2 = \{g_1^2, g_2^2, g_3^2\}$, that $g_1^2 =_x g_1^1, g_2^2 =_x g_2^1$, and $g_3^2 =_x g_3^1$, and
   (c) The simple distributive mode still holds, i.e.
   (a) $\mu^1(f_{g_1^2}(x)) = \mu^1(f_{g_2^2}(x)) = \mu^1(f_{g_3^2}(x)) = \{g_1^2, g_2^2, g_3^2\}$, and
   (b) $\mu^2(f_{g_1^2}(x)) = g_1^2(x)$, $\mu^2(f_{g_2^2}(x)) = g_2^2(x)$, and $\mu^2(f_{g_3^2}(x)) = g_3^2(x)$.

2. $(w_2, S_F^2) \xrightarrow{\exists y} (w_3, S_F^3)$: This step is similar to step 1.
   (a) $w_2 = w_3$,
   (b) $S^3 = \{g_1^3, g_2^3, g_3^3\}$, that $g_1^3 =_y g_1^2, g_2^3 =_y g_2^2$, and $g_3^3 =_y g_3^2$, and
   (c) The simple distributive mode still holds.

3. $(w_3, S_F^3) \overset{all_x(man(x))}{\longrightarrow} (w_4, S_F^4)$: For expository purposes, we assume that $I(w_3, man) = \{m_1, m_2\}$ and $g_1^3(x) = m_1$, $g_2^3(x) = m_2$, and $g_3^3(x) = m_1$. According to the IDPL$^+$ semantics, we first check whether every object assigned to the variable x is a man. By assumption, it turns out yes. Then we check whether the set of object assigned to the variable x is the set of men relative to the world w_3. By assumption, it turns out yes, i.e. $\delta(\mu^1(f_{g_1^3}(x))) = \delta(\mu^1(f_{g_2^3}(x))) = \delta(\mu^1(f_{g_3^3}(x)))) = \{m_1, m_2\}$. So:
   (a) $w_3 = w_4$,
   (b) $S_4 = \{g_1^4, g_2^4, g_3^4\} = S_3$, and
   (c) The simple distributive mode still holds.

4. $(w_4, S_F^4) \overset{j^{Dep(x,y)}}{\longrightarrow} (w_5, S_F^5)$
   (a) $w_4 = w_5$,
   (b) $S_5 = \{g_1^5, g_2^5, g_3^5\} = S_4$, and
   (c) The simple distributive on variable y has been switched to dependent mode, i.e. (a) $\mu^1(f_{g_1^5}(y)) = \mu^1(f_{g_3^5}(y)) = \{g_1^5, g_3^5\}$ and $\mu^1(f_{g_2^5}(y)) = \{g_2^5\}$, and (b) $\mu^2(f_{g_1^5}(y)) = g_1^5(y)$, $\mu^2(f_{g_2^5}(y)) = g_2^5(y)$, and $\mu^2(f_{g_3^5}(y)) = g_3^5(y)$.

5. $(w_5, S_F^5) \overset{a_y(woman(y))}{\longrightarrow} (w_6, S_F^6)$: Again, for simplicity of exposition, we assume that $g_1^5(y) = a_1$, $g_2^5(y) = a_2$, $g_3^5(y) = a_1$, and a_1 and $a_2 \in I(w_5, woman)$. According to the IDPL$^+$ semantics, we first check whether every object assigned to the variable y is a woman. By assumption, it turns out yes. Then we check whether the set of objects assigned to the variable y and corresponding to the first argument of the functional structure has cardinality 1, it turns out yes, i.e. $|\delta(\mu^1(f_{g_1^5}(y)))| = |\delta(\mu^1(f_{g_3^5}(y)))| = |\{a_1\}| = 1$ and $|\delta(\mu^1(f_{g_2^5}(y)))| = |\{a_2\}| = 1$. So:
   (a) $w_6 = w_5$,
   (b) $S_6 = \{g_1^6, g_2^6, g_3^6\} = S_5$, and
   (c) The dependency mode still holds.

6. $(w_6, S_F^6) \stackrel{love(x,y)}{\longrightarrow} (w_7, S_F^7)$: Assume that $< m_1, a_1 >$ and $< m_2, a_2 > \in I(w_6, love)$. According to the IDPL$^+$ semantics, we check whether objects assigned to x and y are pairs of $love$. By assumption, it turns out yes. So:

   (a) $w_7 = w_6$,

   (b) $S_7 = \{g_1^7, g_2^7, g_3^7\} = S_6$, and

   (c) The dependency mode still holds.

7. $(w_7, S_F^7) \stackrel{plural(x)}{\longrightarrow} (w_8, S_F^8)$: Since $(w_7, S_F^7)[more\_than\_one_x(x)](w_7, S_F^7)$, i.e. $|\delta(\mu^1(f_{g_1^7}(x)))| = |\delta(\mu^1(f_{g_2^7}(x)))| = |\delta(\mu^1(f_{g_3^7}(x)))| = |\{m_1, m_2\}| \geq 1$. So:

   (a) $w_8 = w_7$,

   (b) $S_8 = \{g_1^8, g_2^8, g_3^8\} = S_7$, and

   (c) The dependency mode still holds.

8. $(w_8, S_F^8) \stackrel{singular(y)}{\longrightarrow} (w_9, S_F^9)$: Since $(w_8, S_F^8)[one_x(x)](w_8, S_F^8)$, i.e. $|\delta(\mu^1(f_{g_1^8}(y)))| = |\delta(\mu^1(f_{g_3^8}(x)))| = |\{a_2\}| = |\delta(\mu^1(f_{g_2^8}(y)))| = |\{a_2\}| = 1$. So:

   (a) $w_8 = w_8$,

   (b) $S_9 = \{g_1^9, g_2^9, g_3^9\} = S_8$, and

   (c) The dependency mode still holds.

9. $(w_9, S_F^9) \stackrel{snd(x,y)}{\longrightarrow} (w_{10}, S_F^{10})$: Assume that $< m_1, a_1 >$ and $< m_2, a_2 > \in I(w_9, send)$. According to IDPL$^+$ semantics, we check whether objects assigned to x and y are pairs of $send$. By assumption, it turns out yes. So:

   (a) $w_{10} = w_9$,

   (b) $S_{10} = \{g_1^{10}, g_2^{10}, g_3^{10}\} = S_9$, and

   (c) The dependency mode still holds.

We hope that this detailed example has helped to clarify how the formalism works.

7 Information and Coherence in Quantificational Subordination: Some Cases Explained

Our analysis of quantificational subordination is based on three factors discussed in previous sections: (a) compatibility conditions between the output of various universal determiners and pronouns, (b) the availability of the inference of rhetorical relations between discourse segments, and (c) whether an inferred discourse relation can facilitate QS. The first part of the analysis corresponds to the formalism presented in section 6; the second part and the third was informally addressed in section 5.2. We now make the discussion there more concrete.

The first part of the analysis can be summarized as follows. The universal determiners *all*, *every*, and *each* are not intrinsically barriers to anaphora; however, the (dynamic) procedure by which they are processed outputs objects that are intrinsically singular or plural, meaning that only pronouns of the correct type are able to pick them up as antecedents. For instance,

in the examples (6a,b), repeated by (52a) and shown paired with their corresponding logical forms, *every* outputs plural objects from the restrictor position, which plural pronouns may pick up; however, the presence of the 'jump' operator j^{Dep} in (52b) makes the object information accessible to both singular and plural pronouns.

(52) a. *Every man*$_1$ loves *a woman*$_2$. *They*$_1$ send *them*$_2$/*her*$_2$ flowers.

b. $\exists x; \exists y; all_x(man(x)); j^{Dep}(x,y); a_y(woman(y)); love(x,y); plural(x); singular(y); send(x,y)$

c. $\exists x; \exists y; all_x(man(x)); j^{Dep}(x,y); a_y(woman(y)); love(x,y); plural(x); j^{Dis}(y); plural(y); send(x,y)$

Note that in order to get the pronoun *them* in the second sentence of (52a), we have to put $j^{Dis}(y)$ in order to switch the dependency of y on x back to simple distributive information on y. According to our survey, the usage of a plural pronoun in the second sentence of (52b) is better than usage of a singular pronoun. Remember that we defined the simple distributive mode as default in input contexts. The survey of participants' preference shows that the tendency to switch back from the dependent mode to the simple distributive mode is natural for naive speakers. This phenomenon will play an important role in our understanding of information degradation, which we return to in section 8.1.

From the perspective of transitional information processing, then, the universal determiners *all*, *every* and *each* are ambiguous, and create different situations for anaphoric dependence on each reading.

Similar facts hold in the case of telescoping. In example (10), repeated as (53), even though using the strong dependent mode makes the witness output from (53a) available for the singular pronoun in (53b), the inferred discourse relation, *Narration*, does not support QS well, so the discourse turns out little better than marginal.

(53) a. *Each degree*$_1$ candidate walked to the stage. (Sells 1985)
$\exists x; all_x; candidate(x); j^{S-Dep}(x,x); walk(x).$

b. ?*He*$_1$ took his diploma from the dean and returned to his seat.
$singular(x); take(x); return(x).$

However, in our survey, we found that if the singular pronoun in (53b) is changed to a plural pronoun, as in (54b), then the discourse is acceptable.

(54) a. *Each degree*$_1$ candidate walked to the stage. (Sells 1985)
$\exists x; all_x; candidate(x); j^{S-Dep}(x,x); walk(x).$

b. *They*$_1$ took their diplomas from the dean and returned to their seats.
$j^{Dis}(x); plural(x); take(x); return(x).$

To explain the difference between the acceptability of (53a,b) and (54a,b), we refer again to the default reversion to distributive mode. Since we assume that it is a natural tendency to revert to the simple distributive mode, it is obvious that (54a,b) should be more acceptable than (53a,b). Another reason for (54a,b) to be more acceptable than (53a,b) is that simple distributive and dependent modes are also choices for processing (54a) and (53a) which support (release witnesses for) the plural pronoun in (54b) rather then the singular pronoun in (53b).

Similarly, the infelicitous instances in (55) fall out of the inability to infer a rhetorical relation which supports the strong dependency relation. As a result, the right sort of witnesses to serve as antecedent to a singular pronoun will not be obtained.

(55) a. ??*Every dog*$_1$ came in. *It*$_1$ lay down under the sofa. (Poesio & Zucchi 1992)

b. *If *every cat*$_1$ purrs, *it*$_1$ is happy. (Poesio & Zucchi 1992)

c. *John likes *every dog*$_1$ and Sam feeds *it*$_1$. (Hornstein 1984)

The infelicity of example (23), repeated as (56), receives an explanation by the failure to compute a discourse relation of the right type between (56a) and (56b).

(56) a. *Each student*$_1$ in the syntax class was accused of cheating on the exam.

b. **He*$_1$ had a Ph.D. in astrophysics.

On our account, the infelicity of (56) is not directly related to the problem of anaphoric accessibility. Rather, the rhetorical relation here is just not of the right type to support the needed processing mode. This constraint, we argue, accounts for what appears to be a failure of anaphoric accessibility. This last piece of the story is presented in section 8.2.

On our account, then, the infelicity of the impossible cases of telescoping follow directly from independently necessary constraints on the coherence of discourse, not from any *ad hoc* constraints that must be defined on the availability of special update mechanisms. This account is related to, but not identical with, the script-based account of Poesio & Zucchi (1992); unlike their theory, however, our analysis is not specific to quantificational subordination, but falls out of general pragmatic constraints on possible discourses. Our analysis also incorporates a distinction between the information released by various universal quantifiers, which is overlooked in their work. In addition, the explicit invocation of knowledge bases which we make allows us to give an explanation for the marginality of the QS construction in general.

8 Complexity in QS

In this section, we are going to deal with the issues we put aside in the previous sections: the issues of information degradation, rhetorical relations, and the marginality of QS. The facts here are all very subtle, and are completely untouched by previous theories. The ideas we present here represent a first attempt at providing an explanation for these issues.

8.1 QS and Information Degradation

In previous sections, we argued that QS examples can be easily explained in terms of information dependence between discourse constituents, using information content relevant to pronominal interpretation which is released from determiners, and the possibility of inferring discourse relations. An interesting phenomenon observed in Asher & Wang (2003) is that dependency relations between objects degrade rapidly in discourse. In example (57), while (57a) is fine, increasing the number of sentences quickly causes problems; the discourses in (57b and c) have already become degraded.

(57) a. *Each student*$_1$ wrote *a paper*$_2$. *They*$_1$ sent *it*$_2$ to L&P.

b. *Each student*$_1$ wrote *a paper*$_2$. *They*$_1$ sent *it*$_2$ to L&P. *They*$_1$ had worked very hard on *?it*$_2$.

c. *Each student*$_1$ wrote *a paper*$_2$. *They*$_1$ sent *it*$_2$ to L&P. *??It*$_2$ was a good paper.

In fact, degradation also occurs in shorter discourses, although here it is dependent on the presence of particular quantificational elements.

(58) a. *Three students*$_1$ each wrote *a paper*$_2$. *They*$_1$ sent *it*$_2$ to L&P.

b. *Three students*$_1$ each wrote *a paper*$_2$. *They*$_1$ each sent *it*$_2$ to L&P.

For many speakers, (58b) is obviously better than (58a). Even though the required information dependency for the proper interpretation of pronouns in (58a and b) is already created by the floating *each*, as we previously showed, the repetition of this element nevertheless increases the acceptability of the discourse in (58b) by preventing the information released by the determiner from degrading.

In order to explain the degradation effects, we appeal to two ideas: (a) information degradation in QS is caused by the natural tendency of speakers to switch back to the simple distributive mode; (b) determiners and certain rhetorical relations can 'rescue' information from degradation by blocking the tendency to revert to the simple distributive mode. As stated above, we assume that the simple distributive mode is the default, and that the other modes tend to revert back to it over time unless supported. Our formal semantics sets the *simple distributive* mode as the *default* in the input information state. Given this, the decay of information dependency can be explained as a *tendency* to switch back to the simple distributive mode from the dependent and strong dependent modes. In regard to issue (b), we mentioned in sections 3 and 5 that some rhetorical relations facilitate QS better than others. We will provide details in the next section. The use of determiners also prevents information degradation by making the dependent or strong dependent mode able to persist through discourse. In example (59), (59a) and (59c) are better than (59b).

(59) a. *Each man*$_1$ loves *a woman*$_2$. *They*$_1$ send *them*$_2$ flowers.

b. *Each man*$_1$ loves *a woman*$_2$. *They*$_1$ send *her*$_2$ flowers.

c. *Each man*$_1$ loves *a woman*$_2$. *They*$_1$ each send *her*$_2$ flowers.

In (59a), the degradation of dependent information from the first sentence naturally leads to a preference for the plural pronoun *them* rather than the singular pronoun *her* in (59b). In (59c), the determiner *each* in the second sentence activates the dependent mode to prevent information degradation, i.e. we interpret the floating *each* as a kind of mode of processing, either dependent or strong dependent.

8.2 Rhetorical Relations and Information Dependency

We explain the infelicity of (56a,b) by appealing to the failure to construct the right sort of rhetorical relations between (56a) and (56b). Given this account, it may be puzzling that while (56a,b) is infelicitous, its plural variation (25a,b), repeated as (60a,b), is felicitous.

(60) a. *Each student*$_1$ in the syntax class was accused of cheating on the exam.

b. *They*$_1$ had a Ph.D. in astrophysics.

The answer to this objection lies in our analysis of modes of processing. As we can see from the release of the proper information for the plural pronoun in (60b), no dependent or strong dependent mode of processing is used. The felicity of (60a,b) shows that a rhetorical relation is constructed between (60a) and (60b). The rhetorical relation is in fact the *Background* relation. However, in order to release the proper information for singular pronouns in (56b), the strong dependent mode is required. We attribute the infelicity of (56a,b) to the nature of the discourse relation *Background*, which is not *strong* enough in some sense to facilitate the passing of the strong dependent mode to (56b). To explain how rhetorical relations differ in their licensing the persistence of the strong dependent mode, we appeal to the concept of a *hierarchy of information connectivity* in rhetorical relations.

The notion of strength of information connectivity in rhetorical relations is based on the strength of the connection between the information constituents that the relations connect. The stronger the connection, the higher the relation is placed in the hierarchy. We roughly distinguish information connectivity in rhetorical relations by the following three level hierarchy.

- Weak Connectivity: *Background, Explanation, Result, Commentary*
- Intermediate Connectivity: *Narration*.
- Strong Connectivity: *Elaboration*.

The notion of connectivity can be intuitively understood as the extent to which the second argument of the rhetorical relation in question can stand independently in the discourse. For instance, the second argument of *Background* is understood simply as presenting additional information which may be relevant to the first argument. However, the second argument of *Elaboration* has no independent 'life'; without the first argument, it is irrelevant or meaningless, for it serves only to provide details of the event described by the first argument. Even though the hierarchy is rough and a more detailed theory of information connectivity still needs to be worked out, the hierarchy intuitively seems right.[36]

The hierarchy outlined here relates to the QS cases in the following way. The *Background* relation provides only weak information connectivity. However, the strong dependent mode requires that the connection be strong, since that mode of processing is required to provide a suitable antecedent for the singular pronoun. We can also predict that a rhetorical relation which has stronger information connectivity has more power to prevent information degradation. This prediction is confirmed by examples in our survey, e.g. (3a,b) which is connected by *Elaboration* is much more acceptable than (2a,b) which is connected by *Result*.

8.3 Explaining Marginality

We stated above that an explanation of the marginality of QS constructions is important, if not necessary, for a full account of the phenomenon. In this section, we show how our account

[36]Note that the difference between information connectivity among rhetorical relations does not correspond to the difference between subordinating and coordinating rhetorical relations.

can provide at least a route toward an explanation, although we are not yet prepared to give a complete one.

The three components of our account – the modes of processing that are optionally bundled with universal determiners, the inference of discourse relations for discourse coherence, and the effect of information degradation – are all partly pragmatic in nature, in that the processing modes are optional, the inference of discourse coherence is dependent on various information sources beyond simple compositional semantics, and the degradation effect represents the tendency and preference in mode of processing. Because they are pragmatic, they can vary in availability, as follows. The possibility of use of a particular mode of processing is related to whether a particular language user has a preference for using that mode.[37] Similarly, inference of discourse relations in the strict context of QS and telescoping discourses is related to information connectivity provided by rhetorical relations and particular world knowledge that a given speaker may or may not have. The information degradation represents a tendency in the process of processing dependency information. However, pragmatic tendencies of this sort may not be equally shared by every language user. Consequently, these components can fail quite easily given the right context or the wrong speaker. From our perspective, the notorious variation in acceptability from speaker to speaker in examples like these is attributable to the nature of the conditions that allow anaphora.

Understanding the differences of universal determiners provides us with a way to explain the marginality of QS examples. For example, use of a singular pronoun is not totally impossible in (35a). This may be explained by the idea that although some speakers may have a preference for processing the determiner *all* using the distributive mode and dependent mode, certain people are able to process *all* using the strong dependent mode. Conversely, for some people, the singular pronoun in (35b) is not totally acceptable. Given that the modes of processing are optional but admit preferences and dis-preferences, this fact can be explained by stating that the strong dependent mode is not preferred by those speakers for whom (35b) is marginal.

The following examples from Asher (2001) will make clearer our explanation of marginality due to the availability of processing modes.

(61) a. *All students*$_1$ wrote *a paper*$_2$. **He*$_1$ submitted *it*$_2$ to L & P.

b. *Every student*$_1$ wrote *a paper*$_2$. *?He*$_1$ submitted *it*$_2$ to L & P.

For most speakers of English, (61b) is better than (61a). Nonetheless, some people still find (61b) to be unacceptable. According to our semantics for universal determiners, to use a singular pronoun felicitously in the second sentences of (61a and b) it is necessary to make use of the strong dependent mode of processing. However, the strong dependent mode is not available equally to every determiner: it is almost completely unavailable to *all*, but in general available to *every*. This availability of modes of processing explains the hierarchy in felicity of the examples in (61). Another parameter in the felicity judgments has to do with how discourse relations interact with the modes of processing. For some speakers, a discourse relation like *Narration* may suffice to support a strongly dependent processing mode, even though for many this appears not to be the case. This variation, we argue, is another cause of the marginality of telescoping constructions, though more research is needed to investigate the exact interaction between different discourse relations and modes of processing.

[37] There are some other advantages to making use of modes of processing. For example, it provides a consistent and compositional way to make sense of the different readings of plurals. It also makes available a way to understand different quantifier readings without utilizing scope. See Asher & Wang (2003) for details.

9 Concluding Remarks

We summarize what we have done in this paper. We began by showing the result of our survey which shows different judgments on QS examples from what is claimed in the literature. And then, we discussed some previous theories of quantificational subordination that used special mechanisms to extract information from otherwise inaccessible semantic components, arguing that they were inadequate for a general solution of the problem. We showed that such approaches either over-generate or are unable to handle certain types of discourses that, in general, are perfectly felicitous, and argued that the problem of QS is generated from the conditional semantics used by dynamic theories to handle universal quantification. We solved this part of the problem by proposing a semantic formalism which releases information from universal determiners directly. We then moved to block the over-generation made possible by this formalism with the mechanisms for inferring discourse coherence utilized in SDRT. By using these two components, we showed, a unified theory of QS can be developed which is located within a broader landscape of discourse anaphora and discourse structure, rather than standing by itself as a special case. We also showed that our approach provides a means of modelling the marginality of many QS examples.

We close with a pointer to future research. We believe that the account presented here can be generalized to other kinds of discourse subordination. In quantificational subordination, licensing depends on compatibility between the object introduced by a universal quantifier and the pronoun which depends on it. Abstracting away from the quantificational case, subordination comes with a compatibility requirement between a dependent object and its antecedent. In the modal domain, this requirement corresponds to a need for the domains of modal operators to 'fit' one another. In the literature, it has been noted that certain types of modality work together, and others do not:

(62) a. *A wolf*$_1$ might come in. *It*$_1$ would eat you first. (epistemic; subjunctive)

b. *John*$_1$ should buy *a car*$_2$. *He*$_1$ would drive *it*$_2$ (deontic; subjunctive)

(63) a. *A wolf*$_1$ will come in. **It*$_1$ would eat you first. (indicative; subjunctive)

b. *John*$_1$ might buy *a bottle of wine*$_2$. **He*$_1$ should drink *it*$_2$. (epistemic; deontic)

In our terms, the felicity/infelicity of the above examples corresponds to the compatibility of the modal operators involved.

This observation itself is not new; scholars of modal subordination (Roberts 1996; Frank 1997; Geurts 1999; Asher 2002) have all noted it in one form or another. However, we think that our theory provides a new perspective on the facts by claiming that this need for compatibility is not limited to the modal case, but rather holds for all sorts of subordinating contexts. We also take the perspective that, parallel to the quantificational cases which are our main focus here, (a) modal operators are not anaphoric barriers, and (b) anaphoric accessibility is also controlled by whether a discourse is coherent.

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Appendix: Survey Materials

We use the following schema to indicate the judgements of our informants on the examples in the surveys. For a full explanation of the terms used, see section 2. We also provide the rhetorical relations that hold between the two elements in each discourse, where it is relevant for QS in our discussion.

- A: Acceptable.
- $>$A: Better than acceptable
- UA: Unacceptable.
- $<$UA: Worse than Unacceptable.
- M: Marginal.
- $<$M: Better than unacceptable but worse than marginal.
- $>$M: Better than marginal but worse than acceptable.

Survey 1 Material

1. a. Every student went to school. He brought lunch boxes. ($<$UA)
   b. Every student went to school. They brought lunch boxes. ($>$A)
2. a. Each student went to school. He walked. (UA)
   b. Each student went to school. They walked. ($>$A)
3. a. All students went to school. He walked. ($<$UA)
   b. All students went to school. They walked. ($>$A)
4. a. All men love a woman. He sends her flowers. (UA)
   b. All men love a woman. They send her flower. (A)
   c. All men love a woman. He sends them flowers. ($<$UA)
   d. All men love a woman. They send them flowers. ($>$A)
5. a. Every man loves a woman. He sends her flowers. (A)

b. Every man loves a woman. He sends them flowers. (UA)

c. Every man loves a woman. They send her flowers. (A)

d. Every man loves a woman. They send them flowers. (>A)

6. a. Each man loves a woman. He sends her flowers. (A)

b. Each man loves a woman. He sends them flowers. (UA)

c. Each man loves a woman. They send her flowers. (M)

d. Each man loves a woman. They send them flowers. (A)

7. a. All students wrote a paper. He submitted it to a journal. (UA)

b. Every student wrote a paper. He submitted it to a journal (M)

c. Each student wrote a paper. He submitted it to a journal. (A)

8. a. All students wrote a paper. They submitted it to a journal. (>A)

b. Every student wrote a paper. They submitted it to a journal (>A)

c. Each student wrote a paper. They submitted it to a journal. (>A)

9. a. All students wrote a paper. He submitted them to a journal. (UA)

b. Every student wrote a paper. He submitted them to a journal (UA)

c. Each student wrote a paper. He submitted them to a journal. (M)

10. a. All students wrote a paper. They submitted them to a journal. (>A)

b. Every student wrote a paper. They submitted them to a journal (>A)

c. Each student wrote a paper. They submitted them to a journal. (>A)

11. a. Each student wrote a paper. They sent it to a journal. (>A)

b. Each student wrote a paper. They sent it to a journal. They had worked very hard on it. (A)

c. Each student wrote a paper. They sent it to a journal. It was a good paper. (M)

12. a. A train leaves every hour from Boston. It stops in New Haven. (>A)

b. A train leaves every hour from Boston. It always stops in New Haven. (>A)

c. A train leaves every hour from Boston. They stop in New Haven. (M)

d. A train leaves every hour from Boston. They always stop in New Haven. (M)

13. a. Each student in the syntax class was accused of cheating on the exam. He was reprimanded by the dean. (Result, UA)

b. Each student in the syntax class was accused of cheating on the exam. He had a Ph.D. in astrophysics. (Background, <UA)

c. Each student in the syntax class was accused of cheating on the exam. They were reprimanded by the dean. (Result, >A)

d. Each student in the syntax class was accused of cheating on the exam. They had Ph.D.s in astrophysics. (Result, A)

14. a. Every student in the syntax class was accused of cheating on the exam. He was reprimanded by the dean. (Result, UA)

b. Every student in the syntax class was accused of cheating on the exam. He had a Ph.D. in astrophysics. (Background, <UA)

c. Every student in the syntax class was accused of cheating on the exam. They were reprimanded by the dean. (Result, >A)

d. Every student in the syntax class was accused of cheating on the exam. They had Ph.D.s in astrophysics. (Result, A)

15. a. Each degree candidate walked to the stage. He took his diploma from the dean and returned to his seat. (Narration, >M)
    b. Each degree candidate walked to the stage. He was working in a high-tech company. (Background, <UA)
    c. Each degree candidate walked to the stage. They took their diplomas from the dean and returned to their seats. (Narration, >A)
    d. Each degree candidate walked to the stage. They were working in a high-tech company. (Background, A)
16. a. All degree candidates walked to the stage. He took his diploma from the dean and returned to his seat. (Narration, UA)
    b. All degree candidates walked to the stage. He was working in a high-tech company. (Background, <UA)
    c. All degree candidates walked to the stage. They took their diplomas from the dean and returned to their seats. (Narration, >A)
    d. All degree candidates walked to the stage. They were working in a high-tech company. (Background, A)
17. a. Every chess set from that store came with a spare pawn. But then a boy lost it. (Narration, UA)
    b. Every chess set from that store came with a spare pawn. It is taped to the top of the box. (Elaboration, >A)
    c. Every chess set from that store came with a spare pawn. But then a boy lost them. (Narration, A)
    d. Every chess set from that store came with a spare pawn. They are taped to the top of the box. (Elaboration, >A)
18. a. Each chess set from that store came with a spare pawn. But then a boy lost it. (Narration, <M)
    b. Each chess set from that store came with a spare pawn. It is taped to the top of the box. (Elaboration, >A)
    c. Each chess set from that store came with a spare pawn. But then a boy lost them. (Narration, A)
    d. Each chess set from that store came with a spare pawn. They are taped to the top of the box. (Elaboration, >A)
19. a. All chess sets from that store came with a spare pawn. But then a boy lost it. (Narration, UA)
    b. All chess sets from that store came with a spare pawn. It is taped to the top of the box. (Elaboration, >A)
    c. All chess sets from that store came with a spare pawn. But then a boy lost them. (Narration, A)
    d. All chess sets from that store came with a spare pawn. They are taped to the top of the box. (Elaboration, >A)
20. a. Each student in the syntax class cheated cheating on the exam. He did a really bad thing. (Commentary, <UA)
    b. Each student in the syntax class cheated cheating on the exam. They did a really bad thing. (Commentary, A)

Survey 2 Material

1. Three students wrote a paper. He sent it to a journal. (Narration, UA)
2. Three students wrote a paper. They sent it to a journal. (Narration, >A)
3. Three students wrote a paper. He sent them to a journal. (Narration, <UA)
4. Three students wrote a paper. They sent them to a journal. (Narration, >A)

5. Every student in the chemistry class was caught cheating on the exam. He wrote the Periodic Table on his hand. (Explanation, $<$UA)
6. Every student in the chemistry class was caught cheating on the exam. They wrote the Periodic Table on their hands. (Explanation, $>$A)
7. Every student in the chemistry class was caught cheating on the exam. He was reprimanded by the dean. (Result, UA)
8. Every student in the chemistry class was caught cheating on the exam. They were reprimanded by the dean. (Result, $>$A)
9. Each student in the chemistry class was caught cheating on the exam. He wrote the Periodic Table on his hand. (Explanation, UA)
10. Each student in the chemistry class was caught cheating on the exam. They wrote the Periodic Table on their hands. (Explanation, A)
11. Each student in the chemistry class was caught cheating on the exam. He was reprimanded by the dean. (Result, UA)
12. Each student in the chemistry class was caught cheating on the exam. They were reprimanded by the dean. (Result, $>$A)
13. All students in the chemistry class were caught cheating on the exam. He wrote the Periodic Table on his hand. (Explanation, $<$UA)
14. All students in the chemistry class were caught cheating on the exam. They wrote the Periodic Table on their hands. (Explanation, $>$A)
15. All students in the chemistry class were caught cheating on the exam. He was reprimanded by the dean. (Result, UA)
16. All students in the chemistry class were caught cheating on the exam. They were reprimanded by the dean. (Result, $>$A)
17. Every hunter who saw a deer shot it. It died immediately. (Result, $>$M)
18. Every hunter who saw a deer shot it. It usually died immediately. (Result, A)
19. Every hunter who saw a deer shot it. They died immediately. (Result, A)
20. Every hunter who saw a deer shot it. They usually died immediately. (Result, A)
21. Every hunter who saw a deer shot it. He intended to kill it. (Background, M)
22. Every hunter who saw a deer shot it. He intended to kill them. (Background, $<$UA)
23. Every hunter who saw a deer shot it. They intended to kill it. (Background, A)
24. Every hunter who saw a deer shot it. They intended to kill them. (Background, $>$A)
25. Every farmer who owns a donkey beats it. He treats it badly. (Commentary,M)
26. Every farmer who owns a donkey beats it. He always treats it badly. (Commentary, M)
27. Every farmer who owns a donkey beats it. They treat it badly. (Commentary, M)
28. Every farmer who owns a donkey beats it. They always treat it badly. (Commentary, $>$M)
29. Every student in the chemistry class cheated on the exam. He wanted to get an A. (Explanation, UA)
30. Every student in the chemistry class cheated on the exam. They wanted to get an A. (Explanation, $>$A)
31. Each student in the chemistry class cheated on the exam. He wanted to get an A. (Explanation, M)
32. Each student in the chemistry class cheated on the exam. They wanted to get an A. (Explanation, $>$M)
33. All of the students in the chemistry class cheated on the exam. He wanted to get an A. (Explanation, UA)
34. All of the students in the chemistry class cheated on the exam. They wanted to get an A. (Explanation, $>$A)
35. John asks every girl he sees for a date. She usually says yes. (Result, $>$M)
36. John asks every girl he sees for a date. They usually say yes. (Result, $>$A)
37. John asks every girl he sees for a date. She says yes. (Result, $>$UA)
38. John asks every girl he sees for a date. They say yes. (Result, $>$A)
39. Every taxi that comes through here is occupied. It's usually a Yellow Cab. (Background, A)
40. Every taxi that comes through here is occupied. They're usually Yellow Cabs. (Background, $>$A)
41. Every taxi that comes through here is occupied. It's a Yellow Cab. (Background, UA)
42. Every taxi that comes through here is occupied. They're Yellow Cabs. (Background, $>$A)

INFORMATION STRUCTURE AND UNDERSPECIFICATION

SEMANTIC UNDERSPECIFICATION AND THE INTERPRETATION OF COPULAR CLAUSES IN ENGLISH

Ronnie Cann, University of Edinburgh, UK

Abstract

This paper presents an analysis of basic predicative, equative and specificational constructions in English in which the interpretation of *be* is taken to depend on the properties of the expressions with which it combines. Construing the copula as projecting underspecified semantic content within the framework of Dynamic Syntax, provides the basis of an account of these constructions in which a combination of pragmatic and syntactic processes interact to determine the interpretive content of the copula in the context in which it appears.

1 Introduction

The problem with analysing the verb *be* in English (and the copular verb in many other languages) is that it appears in a wide range of constructions which apparently involve complements of different sorts and which show a variety of interpretations.[1] The content of *be* itself appears to vary from apparently nothing, through concepts of identity and specification, to existential and locative interpretations. These differences in interpretation depend crucially on the expressions with which the verb appears. Thus, whenever the postcopular expression is predicative, the content of *be* appears to yield little more than providing tense information, (1).[2]

(1) a. John was foolish.
b. That student is a violinist.
c. Every pet is in the house.

Where both subject and postcopular expressions are 'referential' DPs, the interpretation is either equative (2a) when both are construed as referential or specificational where the subject DP is an

[1]I am grateful to many discussions with Ruth Kempson, with whom many of the ideas in this paper were worked through; to Caroline Heycock for inspiring me to pursue the topic; and to conversations with Lutz Marten, Virve Vihman, Dan Wedgwood, Yicheng Wu, and Stavros Assimakopoulos. I am also grateful to the Edinburgh Syntax and Semantics Research Group, the King's College Dynamic Syntax Group and the audiences at the *Existence* workshop in Nancy and the conference *Where Semantics Meets Pragmatics* at Michigan State University for comments on earlier talks that covered some of the material presented in this paper.

[2]This also appears to be the case with the grammaticalised uses of *be* in passive and progressive constructions which are not considered in this paper.

ordinary definite noun phrase that can be construed as a description of an unknown entity, rather than as picking out some specific object,[3] (2b) or it may be ambiguous between these (2c).

(2) a. Mary is the dancer.
b. The culprit is John.
c. The murderer is the person who had opportunity.

With the expletive *there* and a weak NP associate, the verb appears to provide an existential reading (3a) while with a definite NP associate[4] there tends to be a presentational or locative reading (3b).

(3) a. There is a riot on Princes Street.
b. There's the student you wanted to see.

The existential interpretation appears also in certain uses of the copular without any apparent complement. So we have examples of what may be termed the *existential focus* construction illustrated in (4a), where the verb simply seems to assert the existence of the subject. Such interpretations, though rare, are seen in a number of famous expressions such as those in (4b,c).

(4) a. Neuroses just ARE (they don't need a cause)
b. I think therefore I am.
c. To be or not to be.

There have been many attempts to reconcile these different interpretations of copular constructions and so reduce the apparent homonymy associated with *be*. However, the fact that the interpretation of a clause containing *be* may alter according to the expressions with which it appears, indicates that it is crucially dependent on context for its meaning. Thus, the interpretation of *there be* sentences as presentational or existential seems to be attributable to the definiteness of the post-copular associate, as existence is not (necessarily) predicated of definite associates (see also Mikkelsen 2002; Geist 2002, inter al.). Since the opposite seems to be true in the case of the existential focus construction (or at least that 'true' indefinites seem not to give rise to an existential interpretation), it must be the case that the form of the whole clause contributes to the interpretation. In other words, the interpretation of copular clauses depends on inference in context and should be analysed pragmatically rather than semantically. This is the approach to be taken in this paper in which an essentially anaphoric/expletive story of the copula is provided which relies on a process of pragmatic strengthening, as well as syntactic processes, to account for the different readings of the verb *be* in predicative, equative and specificational clauses.

[3]See Heycock (1994); Heycock & Kroch (1999); Mikkelsen (2002), etc.

[4]A term often used for the postcopular noun phrase in a *there be* construction.

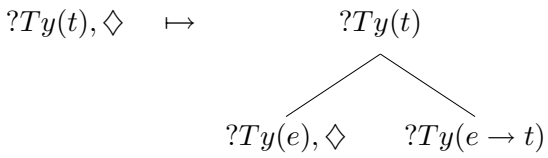
2 Dynamic Syntax

The framework to be used is that of *Dynamic Syntax* (Kempson et al. 2001) which models the process of natural language understanding as the monotonic growth of trees representing the semantic content of some string of words uttered in context. The process is goal-driven, beginning with the initial, universal requirement to establish propositional content for some utterance. Such content is represented in terms of binary trees establishing the argument structure of a proposition as it is built up incrementally through general construction rules, information provided by the words in some string, and pragmatic processes of enrichment. Intrinsic to this process of building up content are concepts of underspecification whose resolution is driven by requirements (goals and subgoals). For the purposes of this paper, a central role is given to the underspecification of semantic content and of the argument status of some element within an emerging propositional structure.

Nodes in trees are decorated with labels specifying (amongst other things) the type of the node (label Ty[5]), its semantic content shown as a lambda expression (Fo) and an address specifying where in the tree the node is (Tn, see below for details). Requirements may be to specify values for any of the labels that decorate a node, but the principal drivers of the parsing process are requirements to establish nodes of certain types, starting from $?Ty(t)$, an instruction to build a tree rooted in $Ty(t)$, the type of a proposition.

To satisfy such requirements, a parse relies on information from various sources. In the first place, there are general processes of construction which give templates for building trees that are (by assumption) universal (although language specific conditions may be imposed on such rules). A pair of such construction rules determine that a tree rooted in $?Ty(Y)$ may be expanded to one with argument daughter $?Ty(X)$ and functor daughter $?Ty(X \rightarrow Y)$. Thus, the initial unfolding of a requirement $?Ty(t)$ may be to establish subgoals $?Ty(e)$ and $?Ty(e \rightarrow t)$, requirements to build the subject and predicate nodes, respectively, as shown in (5).[6] The diamond, $\Diamond$, in the tree diagrams indicates which node is under development.

(5) An initial expansion of $?Ty(t)$



Information about tree building also comes from the packages of actions encoded in lexical entries which are accessed as words are parsed. An entry for a word contains conditional information initiated by a trigger (the condition that provides the context under which subsequent development takes place), a sequence of actions (possibly involving the building of nodes and/or the annotation of a node with type and formula information) and a failure statement (commonly an instruction to abort the parsing sequence) if the conditional action fails. For example, parsing the word *John* gives rise to the set of actions in (6) which annotate the current node with formula

[5]DS uses only a restricted set of types: e the type of a term, t the type of a proposition, cn the type of a common noun, $e \rightarrow t$, the type of a (one-place) predicate and higher arities of predicates. The theory eschews the use of type-altering operations.

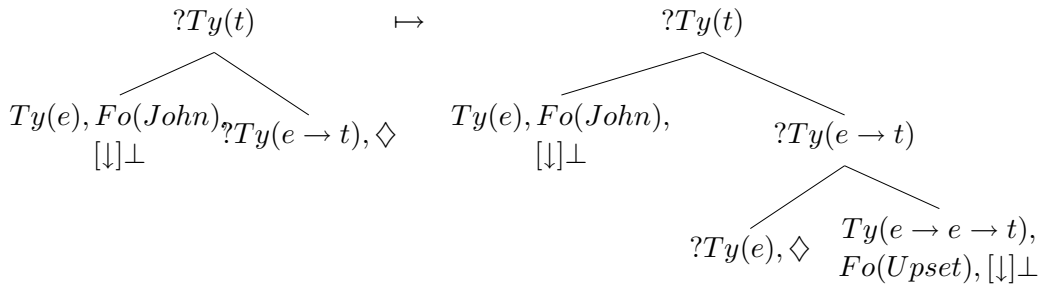
[6]To simplify the exposition, I do not give the formal definitions of the rules in this paper. See Kempson et al. (2001:ch. 3) and Cann et al. (in press:ch. 2) and passim for details.

and type values[7]. Parsing the verb *upset*, on the other hand, gives rise to a more complex set of actions that build and annotate nodes and the imposition of an additional requirement to construct a representation of the content of an object DP as illustrated in (7).[8]

(6)

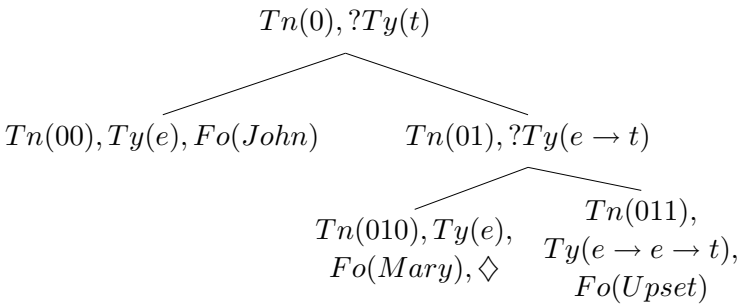
	IF	$Ty(e)$	Trigger
John	THEN	$put(Ty(e), Fo(John), [\downarrow]\bot)$	Actions
	ELSE	ABORT	Failure

(7) Parsing *John upset*

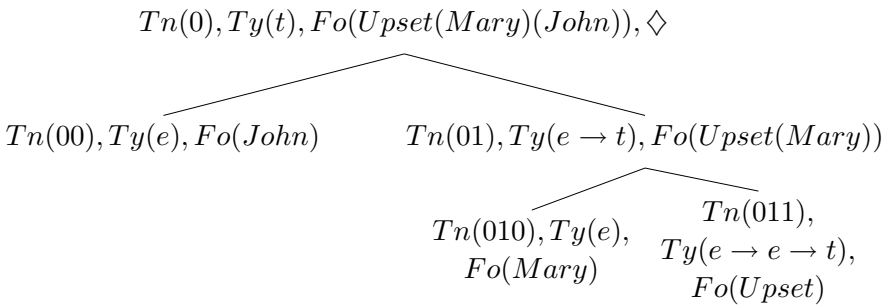


The parse of a string will continue just in case the next word has a trigger of the appropriate type, i.e. $?Ty(e)$. A string like *John upset Mary* will thus give rise to the tree in (8) with all terminal nodes now type and formula complete. The remaining type requirements on the predicate and propositional nodes are satisfied through the COMPILATION of the tree which is obtained by applying functional application over types to yield the completed tree in (9).

(8) Parsing *John upset Mary*



(9) Completing *John upset Mary*



[7]Although see below for a revised view of the actions associated with proper names.

[8]Here and below, all tense information is ignored as not germane to the current discussion. See section 2.2 for discussion of the modality $[\downarrow]\bot$, which marks a node as terminal.

2.1 Left Dislocation

As noted above the driving force of the parsing process is the need to resolve requirements to specify underspecified information, of which the most important is the requirement to construct a formula value with a particular type. However, any predicate used to decorate tree nodes may be associated with a requirement and this will drive the parsing process in different ways. One such requirement is the requirement to find a fixed position within a tree. Every node in a tree is associated with an ADDRESS which is encoded as a value to the TREENODE predicate, Tn. The topnode of a tree has an address $Tn(0)$ from which other addresses are constructed regularly: the functor daughter of a node with address $Tn(n)$ has an address $Tn(n1)$ while the argument daughter has an address $Tn(n0)$. In (9), for example, the node labelled by $Fo(John)$ has an address of $Tn(00)$ while that decorated with $Fo(Upset)$ has $Tn(011)$ and so on.

Annotations of nodes derived through construction rules or lexical actions are expressed using the Logic of Finite Trees (LOFT, Blackburn & Meyer-Viol 1994) which provides a means of referring to arbitrary nodes in a tree using the following modal operators (amongst others): $\langle\downarrow\rangle$ the general daughter relation; $\langle\downarrow_0\rangle$ and $\langle\downarrow_1\rangle$ the argument and functor daughter relations, respectively; $\langle\downarrow_*\rangle$ the dominance relation (the reflexive, transitive closure of the daughter relation); and the inverses of these using the mother relation, $\uparrow$. This logical apparatus allows an expression to project structures that are within some tree but not yet assigned fixed position within it. Instead, a node is annotated as having an underspecified dominance relation with respect to some other node, shown by the modality $\langle\uparrow_*\rangle$, with a requirement to find a fixed position within the tree, represented as $?\exists\mathbf{x}.Tn(\mathbf{x})$. Such positional underspecification is used to account for long distance dependencies which are analysed in terms of initially unfixed nodes whose position in the emergent tree structure is fixed at some later stage in the parsing process. A construction rule of *ADJUNCTION introduces unfixed nodes, defining a transition from an incomplete tree rooted in $?Ty(t)$ with only a single node to a tree that contains in addition a node characterised as dominated by a tree node a with requirements to identify the address of the unfixed node and to construct a type e decoration.[9] The transition induced by this rule is illustrated in (10).

(10) *Adjunction

$$Tn(n), ?Ty(t), \Diamond \quad \mapsto \quad \begin{array}{c} Tn(n), ?Ty(t) \\ \vdots \\ \langle\uparrow_*\rangle Tn(n), ?Ty(e), ?\exists\mathbf{x}.Tn(\mathbf{x}), \Diamond \end{array}$$

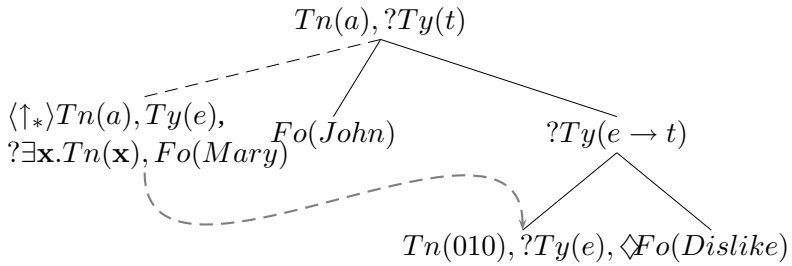
Analysing the string *Mary, John dislikes* in these terms is illustrated in (11) with an initially projected unfixed node and the pointer at the object position. At the point in the parse at which all words in the string have been processed, there remains outstanding an unfixed node and a requirement to construct a node of type e. In this environment, a process of MERGE may take place which unifies the unfixed treenode with the current node. In this process, the information on both nodes is combined and the MERGE is successful, just in case no contradictory decorations result.[10] The MERGE satisfies both outstanding requirements: the unfixed node provides the necessary type and formula decorations, while the fixed node provides the appropriate treenode

[9]The modality $\langle\uparrow_*\rangle$ is defined as: $\langle\uparrow_*\rangle\alpha =_{def} \langle\uparrow\rangle\alpha \vee \langle\uparrow\rangle\langle\uparrow_*\rangle\alpha$.

[10]Well-formed treenode descriptions are thus rather like the categories of Generalised Phrase Structure Grammar which are defined as partial functions from attributes to values (Gazdar et al. 1985).

address for the unfixed tree. Ultimately, completion of the tree yields a $Ty(t)$ formula value, $Dislike(Mary)(John)$ decorating the topnode, with all requirements fulfilled. The Merge process is indicated by the dashed line in (11) and below.

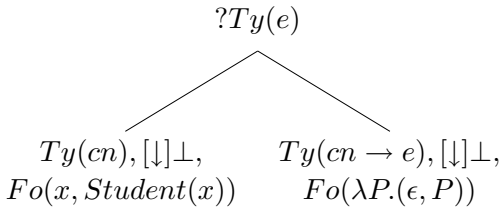
(11) Parsing *Mary, John dislikes*



2.2 Analysing Basic Noun Phrases

In *Dynamic Syntax*, all noun phrases translate into expressions of type e. This is made possible in part by the use of the epsilon calculus of Hilbert & Bernays (1939) where indefinite noun phrases, for example, project epsilon terms, expressions that denote arbitrary witnesses for some property (see also Egli & von Heusinger 1995; Kempson et al. 2001; Meyer-Viol 1995). Despite being of type e, the tree structures that represent the content of such quantified terms is complex, containing two nodes of Type e, that of the top node and one embedded within the structure that hosts the variable bound by the quantifier. A quantified term thus consists of a triple: a quantifier, a variable, and a restrictor containing an instance of the variable determined by the content of the common noun. It is not necessary at this point to go into details, but (12) shows the structure projected on parsing the indefinite noun phrase *a student* which yields a formula $(\epsilon, x, Student(x))$ when compiled and completed.[11]

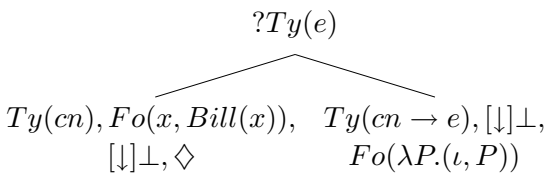
(12) Parsing *a student*



Like indefinites, proper names may be treated as projecting full structure, in this case as iota terms, where an iota term is construed here as an epsilon term with an associated unique choice function that picks out only that object identified by the name. The result of parsing a name like *Bill* is given in (13) (although in the discussion below this structure will not in general be shown).

[11] In fact, there is further structure under the $Ty(cn)$ node that I have omitted for expository purposes. See Kempson et al. (2001:ch. 4) for details.

(13) Parsing *Bill*



Unlike indefinites and proper names, which project full tree structures with fully specified content, pronouns in Dynamic Syntax, while still projecting an expression of type e, provide only underspecified content, reflecting the fact that the processing of anaphors is context dependent. Within DS, such underspecification of content is analysed by means of the projection of a METAVARIABLE, a placeholder for a formula that requires to be replaced by some selected term during the parsing process. Such replacement is associated with a substitution process that is pragmatic, and system-external, restricted by locality considerations (such as analogues of the Binding Principles, Chomsky 1981, etc.) and by lexical presuppositions (such as gender).

(14) Q: Who upset John?
Ans: Mary upset him.

In processing the pronoun *him* in (14), the object node is first decorated with a metavariable **U**, and an associated requirement, $?\exists\mathbf{x}.Fo(\mathbf{x})$, which can only be fulfilled by the identification of some contentful value of the formula label. The relevant actions are shown in (15): on the trigger of a requirement for an expression of type e, a node is annotated with a metavariable, a $Ty(e)$ label, the 'bottom restriction' ($[\downarrow]\bot$) and a requirement to find the content of the formula.[12]

(15)				
		IF	$?Ty(e)$	
		THEN	$put(Fo(\mathbf{U}_{Male(\mathbf{U})}),$	Metavariable
	him		$Ty(e),$	Type
			$?\exists\mathbf{x}.Fo(\mathbf{x}),$	Formula requirement
			$[\downarrow]\bot)$	'Bottom restriction'
		ELSE	ABORT	

The modality, $[\downarrow]\bot$, has an important function within Dynamic Syntax. A node so annotated may not dominate any other material since the modality requires that no properties hold of any node below it (i.e. 'necessarily below this node nothing holds'). It thus prevents further elaboration of that node, ensuring that pronouns behave, in English, like contentive expressions in that they must decorate a 'terminal node' on a tree. This has an effect in preventing dislocated expressions from being associated with a position labelled with a pronoun by the process of MERGE, hence the ungrammaticality of the examples in (16).

(16) a. *Much beer, I like it, but many fizzy drinks, I detest them.
(cf. Much beer, I like, but many fizzy drinks, I detest.)

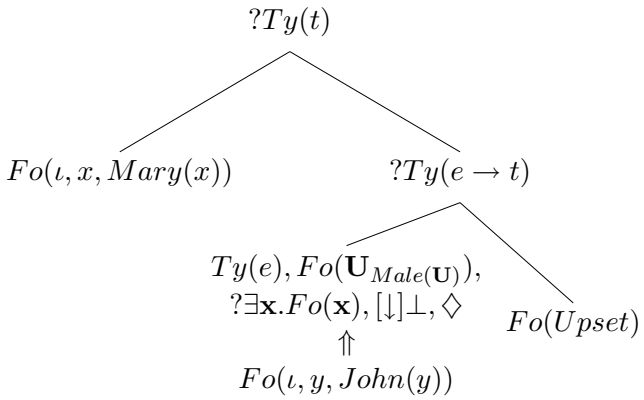
b. *What did you see it?
(cf. What did you see?)

[12]Other information is also projected such as positional restrictions determined by case and by an analogue of Principle B on 'binding'. This is omitted as irrelevant to the discussion.

Pronouns may also come with restrictions on the content of expressions that replace them. Thus, ***him*** requires to be identified with a referent that is male. Kempson et al. (2001) display such presuppositions as annotations on a metavariable, yielding such formula representations for pronouns like ***him*** as $Fo(\mathbf{U}_{Male(\mathbf{U})})$. The function of such 'presuppositions' is to act as a constraint on the process of SUBSTITUTION: the property associated with a metavariable guides the hearer towards a relevant choice of term as substituend. The substitution of $Fo(John)$ rather than (say) $Fo(Jane)$ for the metavariable in (14) is supported by the fact that John is assumed generally to be a name for a male while Jane is not. The fact that the pronoun ***him*** could be used to refer to Jane (or some other female) in a different context (e.g. because Jane is dressed as a man) does not undermine the *use* of the pronoun to identify a relevant term (e.g. by identifying a term picking out something that is dressed as a woman). The property of being male would not, in such circumstances, cash out truth conditionally as a property of whatever term is substituted for the metavariable: the presupposition is a constraint on a pragmatic process, not an assertion that some property holds of some particular term. The result of parsing ***Mary upset him*** in the context provided in (14) is shown in (18b) with substitution shown by the symbol $\Uparrow$. After substitution the information that the string contained a pronoun is entirely lost in the representation, yielding the final propositional formula in (18a).

(17) $Fo(Upset(\iota, y, John(y))(\iota, x, Mary(x)))$.

(18) Parsing ***Mary upset him*** - substitution and completion



Definite noun phrases are treated analogously to pronouns in Dynamic Syntax in projecting underspecified content which requires to be enriched. However, the presuppositional content of such expressions is not projected from the lexicon, as part of the actions associated with parsing ***the***, but comes from the information contained in the common noun phrase associated with the definite article. Thus, the formula projected by a phrase like ***the man*** can be represented as $Fo(\mathbf{U}_{Man(\mathbf{U})})$ while that associated with ***the student with red hair*** may be represented as (something like) $Fo(\mathbf{U}_{Student(\mathbf{U})\wedge With\text{-}Red\text{-}Hair(\mathbf{U})})$. It is possible to provide a compositional and monotonic account of definite noun phrases using the DS concept of LINKed structures (see Kempson et al. 2001:110–120), but as the formal analysis is not germane to the discussion of copular constructions, the full analysis is not provided (see Cann in press, for details). The analysis involves the definite article as projecting a metavariable like a pronoun[13], but additionally induces the construction of a presupposition from the content of the common noun phrase. Like

[13]A reflection of the diachronic development of the definite article from a demonstrative pronoun.

pronouns in English, the definite article also projects the bottom restriction in order to disallow such strings as **Who did you think Jane saw the man?*.

As has already been seen with respect to pronouns, the effect of a metavariable is to force some inferential effort to satisfy the associated requirement to find a formula value. This process involves the identification of some relevant term constructed from the local context which may be some name, actual or arbitrary, or an epsilon term constructed from information already provided within the discourse. Consider the small text in (19).

(19) Mary's PDA was stolen. The culprit got clean away.

Here, the first sentence provides the context for interpreting the definite NP in the second. So we have (something like) $\exists x.Stole(PDA)(x)$ as the formula value for the former. Parsing the definite NP in the latter yields the underspecified formula $Fo(\mathbf{U}_{Culprit(\mathbf{U})})$ which requires the identification of some contextually salient term that also satisfies the property of being a culprit. There are two possible choices of substituend at this point (assuming no other contextually salient terms): the term $Mary$ and the epsilon term signifying the arbitrary individual who stole Mary's PDA, i.e. $(\epsilon, x, Steal(PDA)(x))$. Since someone who steals may be described as a culprit (stealing being a form of wrongdoing and culprits being wrongdoers), and Mary is (in normal circumstances) not likely to have stolen her own PDA, the only relevant choice of term in this context is the epsilon term which is duly substituted for the metavariable to give rise to the formula value in (20a). Since the presupposition is satisfied through the lexical semantics of *steal* over its subject argument, it can be cashed out as an entailment as in (20b) but, because the presupposition has been fully discharged, the informational content is just that in (20c).[14]

(20) a. $Get\text{-}Away(\epsilon, x, Stole(PDA)(x))_{Culprit(\epsilon,x,Stole(PDA)(x))}$.

b. $Get\text{-}Away(\epsilon, x, Stole(PDA)(x)) \ \wedge \ Culprit(\epsilon, x, Stole(PDA)(x))$.

c. $Get\text{-}Away(\epsilon, x, Stole(PDA)(x))$.

2.3 Expletives in Dynamic Syntax

Although pronouns in English are typically associated with the bottom restriction that prevents them from being directly substituted by the content of some dislocated term, there are pronouns that are systematically associated with material that occurs elsewhere in a string. Amongst these is the expletive pronoun *it* in English. In the *it-extraposition* construction in English, illustrated in (21), for example, a subject expletive is associated with a postverbal finite clause.

(21) a. It is likely that I will resign.

b. It was announced that the dean had resigned.

The pronoun *it* in (21b) is not 'referential', taking its value from the context in which the string is uttered, but expletive in that it takes its content from the postverbal expression. Expletive *it* thus appears to provide a placeholder that is subsequently replaced by some propositional formula.

[14] I leave to one side a fuller discussion of the theory of presupposition adopted here, but it resembles in many ways that proposed for DRT in Kamp (2001).

In non-pro-drop languages such as the Germanic languages, lexicalised expletives are essential in such constructions. Without them, the parsing sequence breaks down, because the pointer cannot move on from the subject node without lexical input of the appropriate type. This follows because the trigger for (lexical) verbs is a predicate type requirement ($?Ty(e \rightarrow t)$), not a propositional one, and the verb does not annotate the subject node in any way.[15]

(22) *Is likely that I am confused.

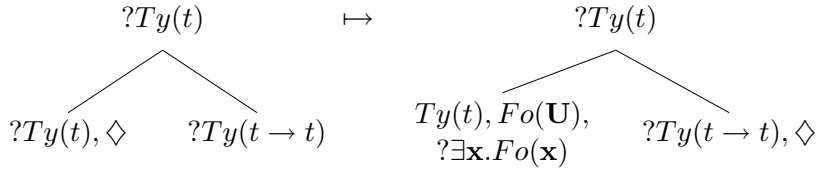
The function of an expletive use of a pronoun, accordingly, is to keep the parsing process alive: it first provides a metavariable as an interim value to some type requirement associated with one node. In addition, the effect of parsing an expletive is also to move the pointer on to another node (the predicate node in this case) in order to preclude substitution, which may only occur at a node when it hosts the pointer. As the pointer is moved on as part of the actions determined by parsing the expletive pronoun, no substitution can take place and an open formula requirement necessarily remains on the node decorated by the metavariable. Finally, the expletive pronoun fails to project the bottom restriction, thus permitting later growth of the tree below the node it decorates, structure which is projected by a right dislocated expression.

The definition of these actions is shown in (23) which assumes that $Ty(t)$ can decorate a subject node, and that certain predicates project a formula of type $t \rightarrow t$.[16] The effect of these lexical actions is to license the transition in (24).

(23)

It	IF	$?Ty(t)$	
	THEN	IF	$\langle\uparrow\rangle\bot$
		THEN	ABORT
		ELSE	$\mathtt{put}(Fo(\mathbf{U}), Ty(t), ?\exists x Fo(x)),$ $\mathtt{go}(\langle\uparrow_0\rangle\langle\downarrow_1\rangle)$
	ELSE	ABORT	

(24) Parsing *it*



Once the verb has been parsed and the predicate node decorated, the pointer moves to the mother node in order to complete the propositional type requirement. However, because the subject node still carries an unsatisfied formula requirement no evaluation can proceed and the pointer must move back down to the subject daughter in order to complete the requirements on this node. Since the node is type-complete, however, it looks as if the parse is doomed to failure. But it is at this point that a variant of *Adjunction, "Late *Adjunction", applies to provide an unfixed node with an open type requirement, allowing the parse of new material to take place.[17]

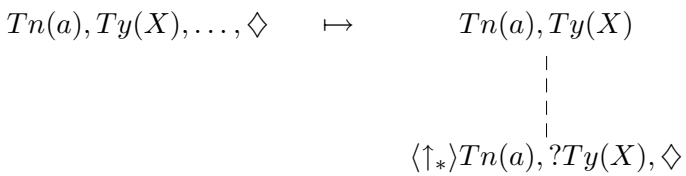
[15]Unlike in pro-drop languages where verbs are analysed as supplying a placeholder for their subject term directly. See Cann et al. (in press) for discussion.

[16]Note the extra condition, $\langle\uparrow\rangle\bot$, which checks whether the current node is the topnode in a tree and aborts the parse if it is, thus preventing *it* from being the sole expression in a sentence.

[17]This form of *Adjunction is used in Cann et al. (in press) to provide an account of Right Node Raising which is based on an earlier analysis in Cann et al. (2003).

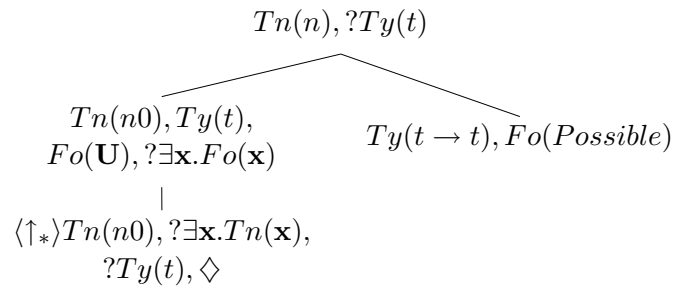
Unlike the version of *Adjunction briefly presented in Section 2.1, Late *Adjunction projects an unfixed node with a requirement for the same type as the node from which it is projected. Since no further direct development of the fixed node is possible, this version of *Adjunction defines directly the structural context to which Merge applies, i.e. the unfixed node and the fixed node from which it is projected. The effect of such a rule is shown in (25).

(25) Late*Adjunction

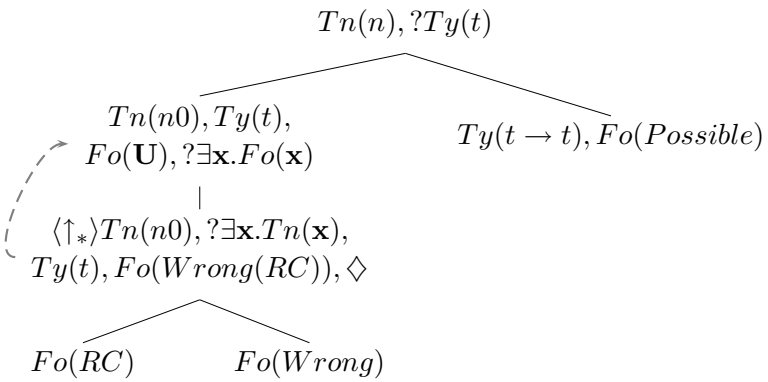


Applying Late*Adjunction to the subject node in a parse of *It is possible* yields the configuration in (26).[18] This permits the parse of the post-verbal string and the completion of the unfixed propositional tree immediately feeds an application of Merge, as shown in (27), which yields a complete subject node and a final formula value $Fo(Possible(Wrong(RC)))$ as desired.[19]

(26) Parsing *It is possible*



(27) Parsing *It is possible that I am wrong*



[18]Ignoring the contribution of the copula (and tense).

[19]I treat the complementizer *that* as fully expletive in this context, i.e. as not providing any significant update to the emerging tree. Whether this is generally appropriate is a problem for another time.

3 Copula Clauses

In section 1, I suggested (as have many others) that the interpretation of *be* is dependent on context and particularly on the properties of the post-copular expression: when there is a definite noun phrase, we have an equative or specificational reading; when there is a predicative expression, a predicative interpretation; when there is no complement, an existential or elliptical interpretation follows. This context dependence points to the hypothesis that *be* projects underspecified content, the value of which is provided from the context in which it appears. Such underspecified content when associated with a pronoun is represented by a metavariable of type e, but metavariables may be postulated for any type and so it seems reasonable to hypothesize that the copula projects a *predicate* metavariable of some sort, with an associated requirement to identify content, possibly through pragmatic inference.

Granted that *be* projects an underspecified predicate, the question still remains as to its arity. Unlike any other auxiliary (or main) verbs in English, *be* appears with 'complements' of every (non-finite) syntactic category apart from a full clause[20] and a bare verb phrase.

(28)	a. Mary is a friend of mine	(predicative) NP
	b. John is the teacher	(definite) NP
	c. Lou will be happy one day	AP
	d. A rabbit is in the garden	PP
	e. The kids were playing football	(progressive) VP
	f. Kim is disliked by Hannibal	(passive) VP
	g. *I am play cricket	(bare) VP
	h. I am to play cricket	(to) VP
	i. *There was John to be in the bathroom	S

This flexibility of complement type is not matched by other auxiliary verbs, where complement categories are restricted to bare VPs, as illustrated with *can* in (29).

(29)	a. *Mary can a friend of mine	NP
	b. *John can the teacher	(definite) NP
	c. *Lou can happy one day	AP
	d. %A rabbit can in the garden	PP (ellipsis only)
	e. *The kids can playing football	(progressive) VP
	f. *Kim can disliked by Hannibal	(passive) VP
	g. I can play cricket	(bare) VP
	h. *I can to play cricket	(to) VP
	i. *There can John to be in the bathroom.	S

[20]Unless one analyses the associate plus coda existential constructions, such as *There was a man being sick outside* as small clauses.

A further difference between the copula and the modals is that the former allows construal of existence in a null context as illustrated in (30) while the latter, such as *may* and *can*, do not license interpretations where the general modality, such as possibility and ability, are ascribed to the subject. Without a complement VP, modals can only be interpreted elliptically, whereas, as we have already seen, *be* can give rise to a non-elliptical interpretation of existence in intransitive contexts.

(30) a. Neuroses just ARE. (= Neuroses exist)

b. Neuroses just MAY. ($\neq$ Neuroses are possible)

c. The students just CAN. ($\neq$ The students are able)

These differences from the auxiliaries, the variability in apparent complement type and non-elliptical interpretation in intransitive contexts, is most easily accommodated by hypothesizing that *no* complement is required or indeed licensed by the copula and that *be* is uniformly a one-place predicate of type $e \rightarrow t$.[21]

3.1 The copula as an expletive

The assumptions that *be* is uniformly intransitive and projects underspecified content can be analysed in DS by having the copula project a metavariable of type $e \rightarrow t$ (shown as $Fo(\mathbf{BE})$), a predicate proform, parallel to pronouns.[22] Under this hypothesis, the machinery set up in the previous section, which is required to analyse constructions not involving the copula, is sufficient to provide a uniform account of *be* in predicative, equative and specificational contexts.

As *be* can have its content established directly within the same clause in predicative constructions, it appears that it has the characteristics of an expletive, as indeed it is treated in many frameworks, at least in its purely auxiliary function. The analysis of expletives presented in the last section rests on three properties:

- The projection of a metavariable to satisfy the type requirement;
- The lack of a bottom restriction, licensing merge with an unfixed node;
- The movement of the pointer away from the trigger node.

Treating *be* as an expletive gives rise to set of lexical actions given in (31) for all forms of the verb: triggered by a predicate requirement, the predicate node is annotated with the metavariable $\mathbf{BE}$ and a requirement for a formula value, and the pointer is moved up to the mother node.[23]

[21] Lamarche (2003) comes to essentially the same conclusion, though for different reasons.

[22] It may be that the type of the copula has to be modified to allow for propositional and property subjects as exemplified in (i) and (ii):

(i) That he will be here soon is highly unlikely.

(ii) Honest is honest.

I do not explore these constructions here, but they do not undermine the essence of the current analysis. The important point here is that *be* does not project an internal argument, whatever the properties of its subject argument may be.

[23] As elsewhere, tense and agreement information is omitted for expository reasons. The latter can be given as a condition on the subject node to be third singular, but the technicalities introduce concepts that are orthogonal to current concerns.

(31)

	IF	$?Ty(e \rightarrow t)$
be	THEN	$\mathtt{put}(Ty(e \rightarrow t), Fo(\mathbf{BE}), ?\exists \mathbf{x}.Fo(\mathbf{x})), \mathtt{go}(\langle\uparrow_1\rangle)$
	ELSE	ABORT

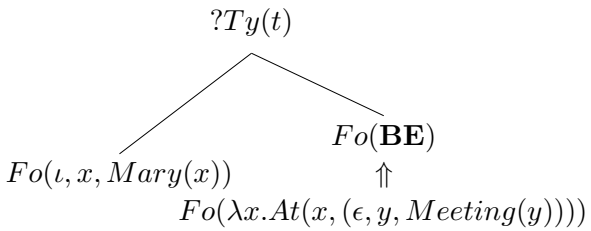
On parsing the copula, then, the value of the metavariable, **BE**, that it projects must be subsequently established, which, like all other values for metavariables, may be freely identified in context. This gives a direct way to account for ellipsis involving the copula, as illustrated in (32), the copula effectively acting as a free proform.

(32) a. John's really happy, John is.

b. A. Who was at the meeting?
B. Mary was.

Under the assumption that *be* projects a metavariable, the elliptical utterances in (32) will be well-formed because the preceding utterance includes an accessible (and relevant) one place predicate which can substitute for the metavariable in the normal way. The situation resulting from parsing the second clause in (32b) for example is shown in (33) up to the point of substitution.[24] The resulting formula is, as required, $Fo(At(Mary, (\epsilon, y, Meeting(y))))$.[25]

(33) Parsing *Mary was*



Interestingly enough, this analysis also directly accounts for the possible interpretation of *be* as existential in the existential focus constructions illustrated in (4a) repeated below:

(4) a. Neuroses just ARE.

---

[24]From now on, trees will be simplified through the omission of completed types and irrelevant information. It should be stressed that while the trees that follow have nodes that are decorated only by formulae, this is not technically the case.

[25]It is not the case that just any predicate can associate with *be*, of course, but only stative predicates that are associated with non-verbal expressions.

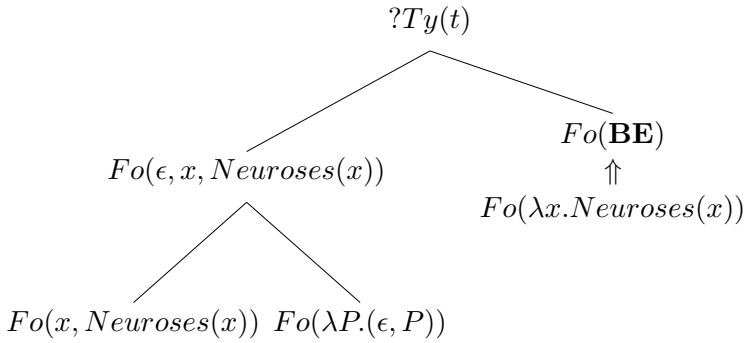
(i) *Kim knows the answer and Lou is, too.

(ii) *Kim is knows the answer.

Maienborn (2002) argues for a differentiation between Davidsonian states (or D-states) and states that she refers to as K-states following Kim (1969, 1976)'s notion of temporally bounded property exemplifications. She suggests that such states are not eventualities but form a separate class of abstract object (in the sense of Asher 1993) somewhere between world bound facts and spatio-temporally defined eventualities. This restriction may be achieved in DS by showing this as a presuppositional condition on substitution. However, I ignore the consequences of this move (which are significant for the interpretation of the progressive) in this paper.

In identifying the potential substituends for the predicate metavariable **BE**, the context also includes predicates derivable from the tree currently under construction. Thus, instead of identifying a predicate from the previous discourse, a hearer may construct one from the immediate context (the tree currently under construction) and substitute that for the predicate metavariable. In the tree constructed to parse (4a), the only available predicate is that derived from the common noun in the subject position, as illustrated in (34).

(34) Parsing *Neuroses (just)* ARE



Making this substitution gives rise to the output formula in (35a) which, by the established equivalence in the epsilon calculus shown in (35b), gives rise to the existential statement in (35c).

(35) a. $Fo(Neuroses(\epsilon, x, Neuroses(x)))$

b. $F(\epsilon, x, F(x)) \leftrightarrow \exists x.F(x)$

c. $\exists x.Neuroses(x)$

While more needs to be said about the existential focus construction, especially with respect to the possibility of quantified subjects and the interaction with tense, it should be clear from this discussion that the treatment of *be* as projecting semantically underspecified content that may be pragmatically enriched provides a basis of a unified account of both ellipsis in copula clauses and existential focus readings, an unexpected result.

3.2 Predicative constructions

The analysis of *be* as a predicate expletive allows us to tackle the bewildering variety of copular constructions in English in a uniform manner, the burden of explanation shifting from considerations of the core 'meaning' of *be* as denoting existence, predication or identity to an account of inference in context that derives the expected interpretations of sentences.

In the elliptical case discussed above, the update for the predicate metavariable projected by *be* is determined through pragmatic substitution. However, there is a construction in which the appropriate predicate is supplied syntactically without the intervention of pragmatics. This is the basic predicative construction where a non-verbal predicate appears in postcopular position and *be* appears to be entirely meaningless (apart possibly for constraints on event type, see Rothstein 2001; Maienborn 2002, inter alia).

(36) a. John is happy.

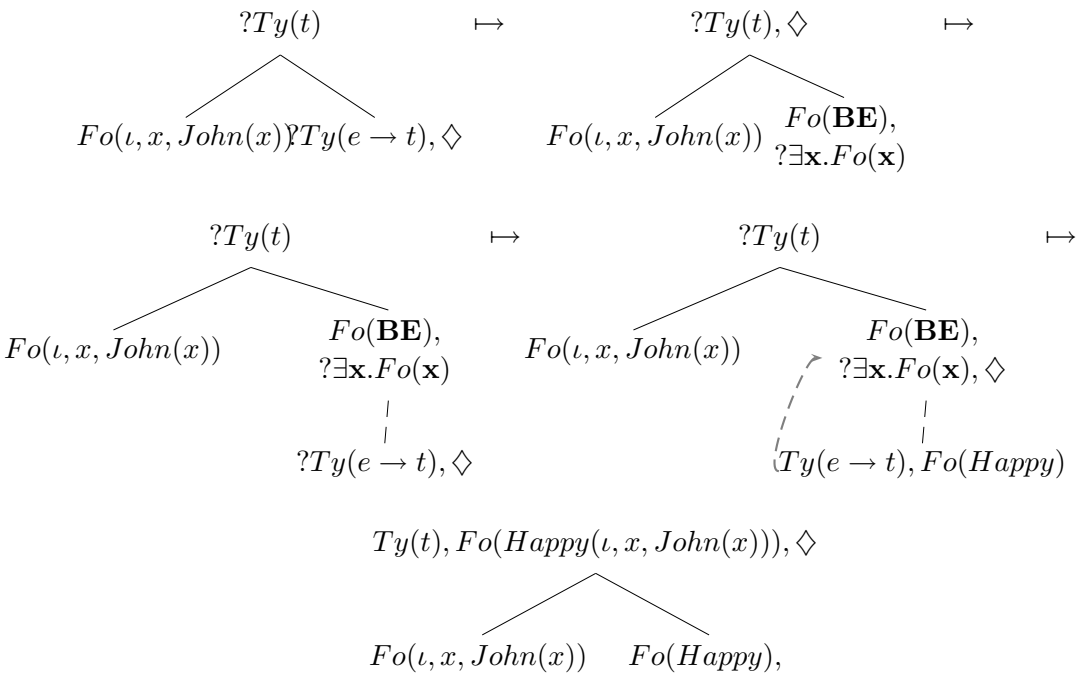
b. Robert was on a train.

c. Mary is a teacher.

We already have the machinery to analyse this construction straightforwardly. Note that the lexical entry for the copula in (31) does not write a bottom restriction to the predicate node, giving it one of the characteristic properties of an expletive. This allows us to use the same mechanism, Late*Adjunction, that we used to account for it-extraposition above, except that the unfixed node is projected from the predicate, and not the subject, node.

To see how the analysis works, consider the parse of (36a). The first two words project a subject-predicate structure in the normal way and the pointer is on the top node. At this point, all type requirements are fulfilled but there remains an outstanding formula requirement on the predicate node which prevents the tree from being completed. The pointer thus must move back to the incomplete predicate node, permitting an application of Late*Adjunction which provides an unfixed node with type requirement $?Ty(e \rightarrow t)$ (the rule is free with respect to the type of node). This permits the parse of any one-place predicate, in this case the simple adjective *happy*. The node decorated by the adjective then merges with the underspecified main predicate expression, satisfying both the requirement of the unfixed node to find a fixed position within the tree and the requirement that **BE** be replaced by some contentful concept. This process is illustrated in (37), from the parse of the initial word *John*, through the parsing of the copula, the unfolding of the unfixed node and the parse of the predicate to give the result in the final tree.

(37) Parsing *John is happy.*



Prepositional predicates may be treated in the same way, under the (natural) assumption that such expressions may be of predicate type. So, a sentence like that in (38a) gets the formula value in (38b).

(38) a. Robert was on a train.

b. $\lambda x.(On(\epsilon, y, Train(y))(x))(\iota, x, Robert(x))$.

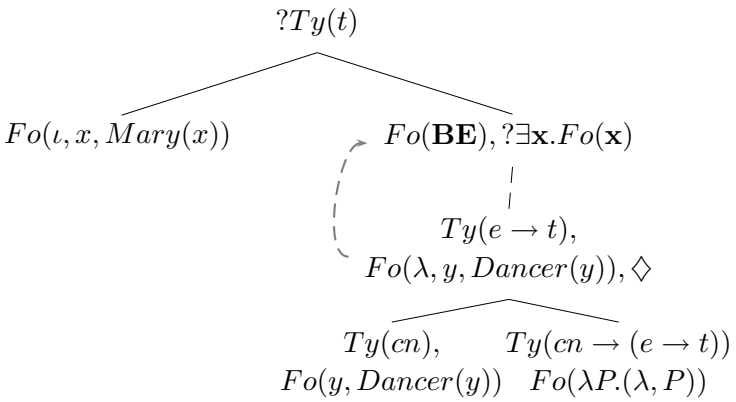
For common noun predicates, in some languages such as Classical (and Modern) Greek, the nominal predicate may be treated directly as a predicate just like an adjective or a prepositional phrase and be analysed accordingly, the expression in (39a) giving rise to the formula value in (39b) through merge of the nominal predicate with the metavariable projected by the copula.

(39) a. *ho* *sōkratēs* *ēn* *philosophos.*
the.nom.sg Socrates.nom.sg be.3.sg.impf philosopher.nom.sg
'Socrates was a philosopher.'

b. $Philosopher(Socrates)$.

For nominal predicates in English, a slightly more complicated story needs to be told because of the appearance of the indefinite article in singular constructions: *The student is *(a) genius*.[26] A trivial way of analysing this construction is to treat the indefinite article as being ambiguous between something that constructs an epsilon term in the context of a requirement to construct an expression of type e and one that makes a common noun into a one-place predicate in a context in which such an expression is required. A sentence like *Mary is a dancer* may then be parsed in the same way as other post-copular predicate constructions, as illustrated in (40). The indefinite article then provides some binder for the distinguished variable in the common noun, an epsilon operator in the context of a requirement for a term and a lambda operator in the context of the requirement for a one-place predicate. The output formula is simply $Fo(Dancer(Mary))$ as required.[27]

(40) Parsing *Mary is a dancer*



[26]Plural nominal predicates do not pose a problem and can be analysed as predicates that merge with the main predicate node. (i) thus gets interpreted as (ii) directly through MERGE.

i. Those students are fools.

ii. $Fool(\epsilon, x, Student(x) \wedge Plural(x))$.

[27]A more interesting story might be told by treating the postcopular noun phrase as projecting an epsilon term and merging this with the terms provided by the subject, along the lines of the equative construction discussed in the next section. However, the fact that both subject and predicative term project full structures precludes a straightforward adaptation of this analysis and so I leave this possibility to one side, but see Cann et al. (in press:ch. 8) for some discussion.

3.3 Equative Clauses

Equative clauses are typically described as involving the identification of the referents of two definite, referential, noun phrases that appear with the copula. This equating function may be viewed as deriving from the copula (Montague 1973; Dowty et al. 1981, inter alia) or through some operation on the term expressed by the postcopular noun phrase (e.g. Partee 1986; Williams 1983). In both cases the effect is the same: the copula is treated as a two-place predicate of some sort and the output is a statement of identification between the two terms, $\alpha = \beta$. If the assumption put forward above is correct, that the copula is an expletive one-place predicate without explicit semantic content, the question arises as to whether and how a relation of identity can be derived.

An obvious way of accounting for equatives would be to adapt the approach of Partee (1986) which treats the copula as essentially predicative (of type $(e \rightarrow t) \rightarrow (e \rightarrow t)$ with the semantic structure proposed in Montague 1973 (although with lower typing), i.e. $\lambda P \lambda x.P(x)$[28]) with a type shifting operation (**Ident**) on a postcopular term to turn it into an identity predicate. Within the current framework one could allow referential noun phrases to be homonymous between a term and an identity predicate founded on an epsilon term constructed from the common noun phrase (e.g. *the teacher* could be realised either as $\mathbf{U}_{Teacher(\mathbf{U})}$ in a context requiring a term or $\lambda x.x = \epsilon, x, Teacher(x)$ in a predicate context). The analysis could then follow that given for predicative expressions above, deriving equative expressions directly.

A more interesting approach suggests itself, however, that exploits the machinery of Dynamic Syntax presented above and derives the equative interpretation without recourse to assuming that either the copular or the definite article (or other definite determiners) are homonymous.[29] As we have seen, equative and specificational clauses necessarily involve a definite noun phrase, either before or after the copula (or both) and a copular clause without a definite cannot be easily interpreted as equative or specificational, as illustrated in (41).

(41)
a. John is the teacher. *Equative*
b. That student over there is the best in the class. *Equative*
c. The best in the class is that student over there. *Specificational/Equative*
d. The culprit is John. *Specificational*
e. A PhD student is the lecturer for this course. *Equative?*
f. A plant is a gift for life. *Predicative*

There must something specific to definite expressions which allows equative or specificational readings that is not available to other types of noun phrase. To see what this might be, consider

[28]Partee, in fact, allows a variable type and analysis with the arguments of the expression appearing in either order, i.e. $\lambda x \lambda P.P(x) : e \rightarrow ((e \rightarrow t) \rightarrow t)$.

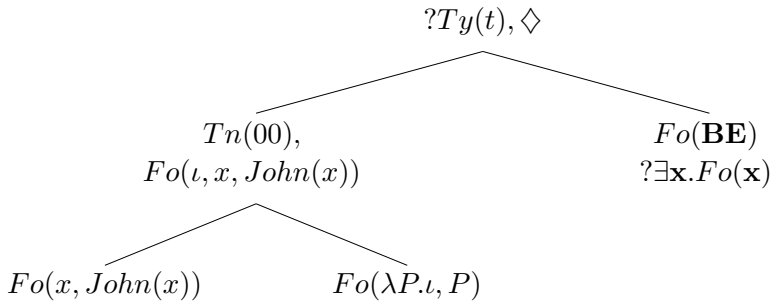
[29]It may be objected that, since I have treated the indefinite article as homonymous in the previous subsection, there is no a priori reason to reject such an analysis for the definites. However, there are two reasons for eschewing homonymy for definites in this case. Firstly, there is only one indefinite article involved in the predicative construction, *a*. Even plural *some* does not give rise to a predicative reading (*John and Mary are some teachers* is not synonymous with *John and Mary are teachers*). For definites, it would have to be assumed that all definite determiners, including demonstratives, are homonymous, so that the homonymy is not lexically restricted. Secondly, the analysis proposed for definite noun phrases in terms of a metavariable plus 'presupposition' seems not to be easily relatable to an operation that turns an epsilon term into an identify predicate. There would, therefore, be no obvious explanation for why it is definites in particular that are subject to this particular interpretation.

the short text in (3.3). In interpreting the equative clause in B's utterance, the hearer, A, assumes the existence of someone who drank the last of the milk and then identifies this person with John through the semantics of the concept $Culprit$.

(42) **A**: Oh no, someone has drunk the last of the milk again.
B: John is the culprit.

Analysing *John is the culprit*, we begin by establishing the structure in (43) through the parsing of the first two words (ignoring tense as usual).

(43) Parsing *John is*

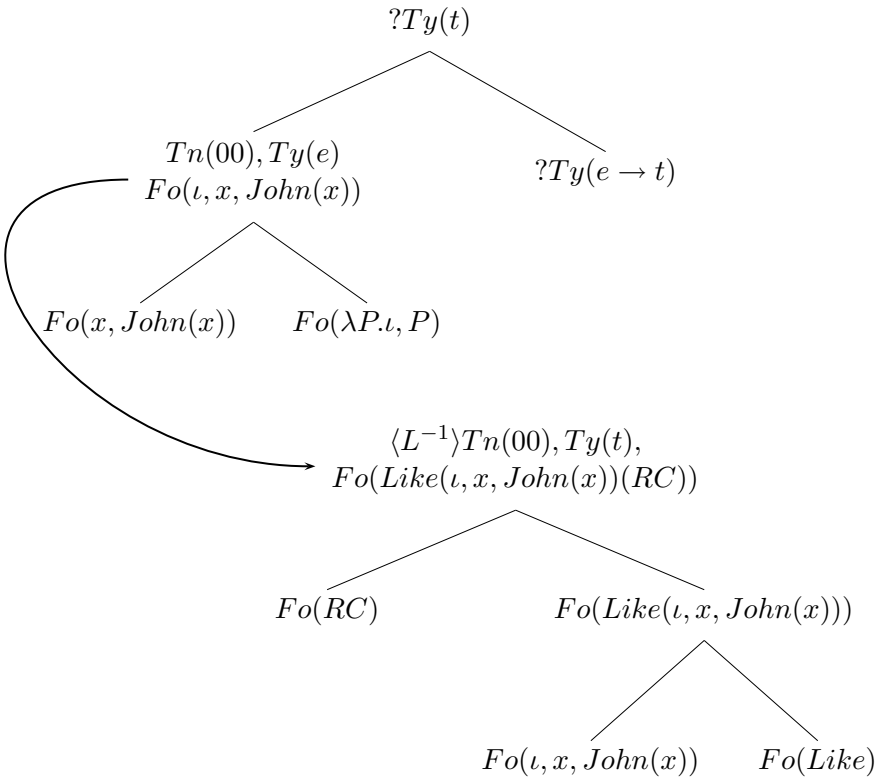


At this point the predicate node remains incomplete and so the pointer must move down the tree from the topnode. One possibility, of course, is that it moves to the subject node, a move that is permitted even though the node is complete. Further development of this node, on the other hand, is possible only if restrictions associated with the node are not violated (such as the bottom restriction $[\downarrow]\bot$) and the resulting structure does not give rise to contradictory information holding of dominated nodes. Clearly with respect to (43) any development by Late*Adjunction is likely to lead to an ill-formed outcome, as any growth from the subject node will contain information that clashes with the formula (and possible other) information holding at that node: for example, the structure induced from a parse of *the culprit* will be incompatible with that projected by *John* because the former will project a bottom restriction which is contradicted by the daughters projected by the latter. This is not to say that *no* development of the tree from the subject node is disallowed, but any further update must not result in the node dominating any other node.

One of the innovative aspects of Dynamic Syntax is that it allows for the building of structures in tandem, constructing first one partial structure, and then another which uses the first as its context. A characteristic property of such "linked" structures is that they typically share a common term, and furthermore, the process of inducing the second of such a pair of structures involves a transition from one tree to the other which itself imposes a constraint for a second occurrence of the term to be shared in that second tree. LINK structures have their clearest application in characterising relative clauses, where from a completed $Ty(e)$ node decorated by a term $Fo(\alpha)$ a new propositional tree is projected which is required to contain a copy of $Fo(\alpha)$.

The full details of the DS analysis of Relative Clauses are not important here (for which see Kempson et al. 2001; Kempson 2002), but as an illustration the figure in (44) shows the structure induced by the parse of the first four words of the sentence *John, who I like, smokes*, where the thick black line indicates the LINK relation and the first person pronoun is taken to pick out the author.

(44) Parsing *John, who I like,*



The modality that connects the LINKed propositional tree to its host node is a novel one: $\langle L^{-1}\rangle$ (and its inverse $\langle L\rangle$). This modality is independent of the mother/daughter dominance relations ($\uparrow$ and $\downarrow$) which do not carry over from one tree to a LINKed tree. So while $\langle\downarrow\rangle Fo(x, John(x))$ holds of node $Tn(00)$, $\langle\downarrow\rangle Fo(Like(\iota, x, John(x))(RC))$ does not. Conversely, $\langle L\rangle Fo(Like(\iota, x, John(x))(RC))$ holds of node $Tn(00)$, while $\langle L\rangle Fo(x, John(x))$ does not. The LINK mechanism therefore provides a means of developing structure from a node without violating the bottom restriction.

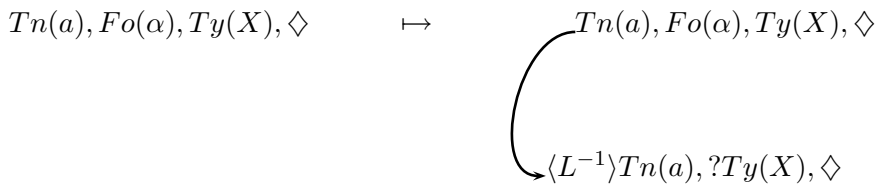
Although the LINK mechanism has its clearest application in the analysis of relative clauses, it may be used for other types of modification as well. In particular, it may be used to account for the stacking of noun phrases in apposition constructions, as illustrated in (45).[30]

(45) Ruth, a colleague from London, a Leverhulme research professor, is giving a talk next week.

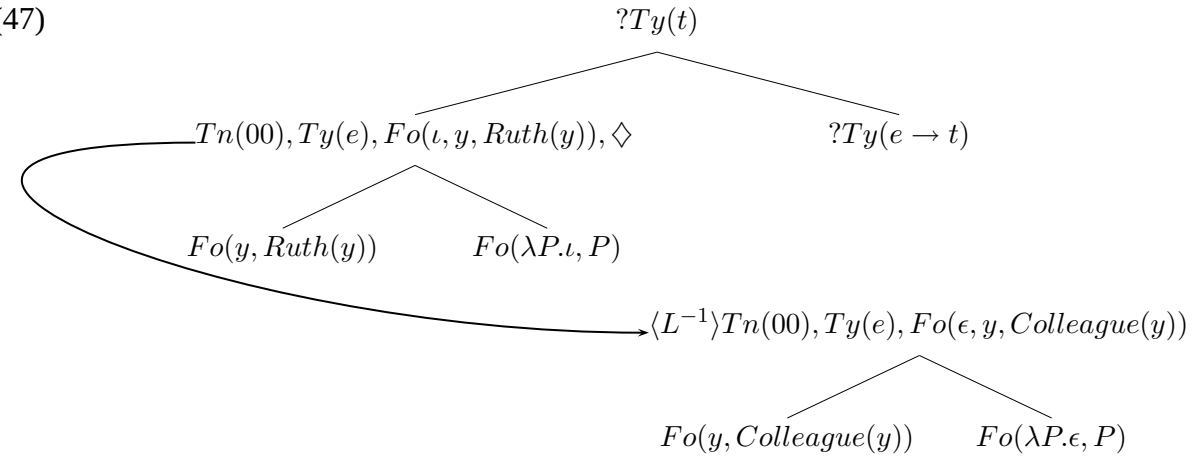
Such constructions can be analysed straightforwardly through LINK and we can posit a general rule that induces a LINKed structure with a requirement for a formula as the same type as the node from which the structure is projected. The effect of this rule is shown in (46), where again the thick black arrow shows the LINK relation, and the tree analysing the initial three words of the string *Ruth, a colleague (from London), is giving a talk next week* is given in (47).

[30]See also Swinburne (1999) for further uses of the LINK modality to analyse modifier constructions.

(46) Appositive LINK Adjunction

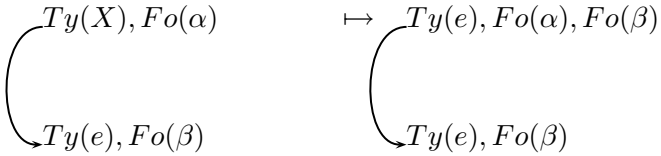


(47)



Note that this rule does not impose a requirement that the LINKed tree share a term with the host. In this structure, the interpretive interdependence of the two trees is established through an evaluation rule that combines the content of the LINKed tree with that of its host node. This it does by simply copying the formula value from the rootnode of the LINKed tree onto the host node, as shown in (48)[31]

(48) Appositive LINK Evaluation



Applying this to the structure in (47) gives rise to a decoration on the subject node of two distinct formula values, i.e. $Fo(\iota, x, Ruth(x))$ and $Fo(\epsilon, x, Colleague(x))$. Decorations on nodes must, however, be coherent, i.e. not involve incompatible values for the same label, where compatibility is defined as identity or subsumption: $\alpha \leq \beta$. Since it is not the case that $Fo(\iota, x, Ruth(x)) \leq Fo(\epsilon, x, Colleague(x))$, this result should be ill-formed. However, we may exploit the identity part of the subsumption ($\leq$) relation over informativeness and allow two formula values to decorate the same node just in case they are as informative as each other, the interpretation of the node thus not involving contradictory information. From a semantic point of view this will be (extensionally) satisfied as long as the two formulae have identical denotations. Although such a semantic condition might seem to be at odds with the representationalist

[31]For more discussion of LINK evaluation rules and their application see Kempson (2002) and Cann et al. (in press).

spirit of Dynamic Syntax, the properties of the epsilon calculus may be exploited to provide a straightforward way of incorporating this idea into the representation system. If two distinct epsilon terms, $\epsilon, x, P(x)$ and $\epsilon, x, Q(x)$, both denote the same entity (whatever that may be), then $Q(\epsilon, x, Q(x))$ and $Q(\epsilon, x, P(x))$ must both have the same truth value, i.e. the witness for P is a witness for Q (and vice versa). A proposition $Q(\epsilon, x, P(x))$ licenses the construction of a term $(\epsilon, x, P(x) \wedge Q(x))$ to pick out the witness of the two predicates P and Q. Thus, $Q(\epsilon, x, Q(x))$, $Q(\epsilon, x, P(x))$, and $Q(\epsilon, x, P(x) \wedge Q(x))$ are all truth conditionally equivalent under this assumption so we may substitute $(\epsilon, x, P(x) \wedge Q(x))$ for $(\epsilon, x, Q(x))$ salva veritate. This then allows a node which contains two epsilon terms to be resolved into a single term which picks out the witness for both restrictors.

Using this result, it is possible to give a representational slant to the idea that the merge of two formulae is permissible just in case they are denotationally identical, by adopting a resolution rule that combines two epsilon terms into a single term, if these decorate the same node. The rule is shown as an inference rule in (49) and the result of applying it to the subject node in (47) is shown in (50), a formula which picks out the (unique) entity that is Ruth and a colleague.[32]

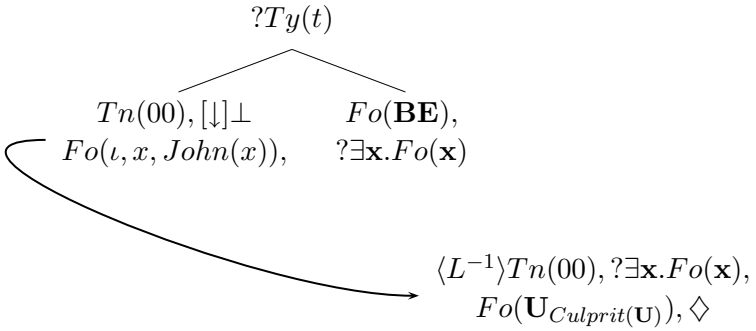
(49) Term Resolution:

$$\frac{Fo(\epsilon, x, P(x)), Fo(\epsilon, x, Q(x)),}{Fo(\epsilon, x, (P(x) \wedge Q(x))}$$

(50) $Fo(\iota, x, Ruth(x) \wedge Colleague(x))$.

So, there is now the possibility of developing the subject node in (43) by applying the Appositive LINK Adjunction rule to project a LINK structure with a type e requirement. This permits the parse of a post-copular noun phrase such as the definite noun phrase *the teacher*, as shown in (51).

(51) Parsing *John is the culprit* via Appositive LINK Adjunction



Next the value of the metavariable projected by the definite article may be established. Substitution of this is constrained by the presuppositional information that the substituting term must

[32]The formula retains the iota operator as defining a more restricted type of epsilon term, one with a unique value in any context.

be describable as a culprit. Such a substituend is provided by the content of A's utterance by taking the epsilon term that picks out the witness for the act of drinking the last of the milk, i.e. $(\epsilon, x, Drink(m)(x))$ (where m is a term denoting the last of the milk that was drunk). Under the assumptions that someone who drinks the last of the milk (without getting more) is guilty of wrongdoing and that someone who is guilty of wrongdoing is describable as a culprit, the substitution of this term for the metavariable projected by the definite is licensed (through abduction on the semantics of culprit) and the presupposition discharged. These steps of reasoning are summarised in (52).

(52) a. **Given Context**: $\exists x.Drink(m)(x)$.

b. **Arbitrary term satisfying a**: $(\epsilon, x, Drink(m)(x))$.

c. **Assumption**: $Drink(m)(\alpha) \vdash Wrongdoer(\alpha)$

d. **Semantics of Culprit**: $Culprit(\alpha) \vdash Wrongdoer(\alpha)$

e. **Substitution**: $Fo(\mathbf{U}_{Culprit(\mathbf{U})}) \Leftarrow Fo((\epsilon, x, Drink(m)(x))$

Appositive LINK Evaluation and Term Resolution then apply to the resulting structure to give the annotation on the subject node shown in (53).[33]

(53) **Term resolution** : $Ty(e), Fo((\iota, x, John(x) \wedge Drink(m)(x)_{Culprit(\epsilon,x,Drink(m)(x))})$

Notice that Term Resolution in (49) effectively determines the identity of two terms by picking out the witness for both internal predicates: it captures identity without the need for any type-raising operation or even the use of the identity relation. Hence, the equative reading is neither particular to the content of the copula nor derived from some operation on the denotation of a noun phrase. Instead, the identity of the two terms in an equative clause is derived through grammatical operations (Appositive LINK Adjunction and Evaluation) that are themselves independently required to account for certain types of modification.

The analysis has not yet finished, however, as the value for the predicate still needs to be identified. In keeping with the assumptions of Dynamic Syntax, I adopt a general Relevance Theoretic perspective on pragmatic processes such as substitution whereby there is a trade-off between processing cost and information gained (see Sperber & Wilson 1989/1995; Carston 2002 for proper discussion of the theory). Optimal Relevance is determined as a trade-off between cognitive effort and informativeness (the more effort required to access an interpretation the more informative it should be). A hearer will thus take as substituend the most accessible formula that is likely to yield significant inferential effects. The pragmatic process of substitution occurs *within* the construction of a propositional representation, however, and so will tend to prefer substituends which are provided by the immediate discourse because the domain over which other inferences are to be carried out may not yet be complete. In substituting for the predicate metavariable in (51), the context given in (3.3) provides the three candidate predicates in (54), the most informative of which should be chosen as the substituend.

[33]The formula retains the iota operator as defining a more restricted type of epsilon term, one with a unique value in any context.

(54) **Possible Predicate Substituends**:

a. From *the culprit*: $\lambda y.Culprit(y)$.

b. From substituend (and main predicate of A's utterance): $\lambda y.Drink(m)(y)$

c. From *the (last of the) milk*: $\lambda x.Milk(x)$

Of the predicates in (54), (54c), picking out the property of being milk, is least likely to be chosen because of the (likely) processing cost needed to derive useful inferential effect from the proposition that *John is milk*. Of the remaining two predicates, that of being a culprit has been used to identify the appropriateness of substituting $\epsilon, x, Drink(m)(x)$ for $\mathbf{U}_{Culprit(\mathbf{U})}$ and so is less informative than (54b), the property of drinking the last of the milk, leaving the latter as the most informative potential substituend in the context.[34]

The result in (55a) of choosing (54b) as the substituend for $\mathbf{BE}$ is shown in (55b). Given the equivalence in (55c) (which has already been used above to account for the interpretation of certain existential focus constructions), the output content of parsing *John is the culprit* in the context given is that in (55d), a statement asserting that someone did steal the last of the milk (a confirmation of A's initial assertion in (3.3)) and that that someone is John, as required.

(55) a. **Substitution**: $Fo(\mathbf{BE}) \Leftarrow Fo(\lambda y.Drink(m)(y))$.

b. $Fo(Drink(m)(\iota, x, John(x) \wedge Drink(m)(x)))$

c. $F(\epsilon, x, F(x)) \equiv \exists x.F(x)$

d. $\exists x.John(x) \wedge Drink(m)(x)$
There exists someone who drank the last of the milk and that person is John.

By exploiting underspecification of various sorts and the inferential process of substitution, I have provided an account of the interpretation of equative clauses without the use of the logical identity operator. The only additional requirement I have had to make is that two epsilon terms decorating the same node may be resolved into one complex one. Such a resolution is motivated by the general and independent requirement that information on nodes not be contradictory, rather than by any specific consideration of the equative construction itself. This resolution does not involve type changing or indeed the use of identity at all[35] but simply from the notion of content underspecification as applied to the copula.

3.4 Specificational Clauses

We turn now to specificational clauses, which as mentioned above, like equatives, involve two apparently referential noun phrases. However, unlike true equatives specificational sentences involve a definite in pre-copular position which can be construed as a description rather than as picking out some definite entity. In other words, the subject definite provides a description whose referent is assumed to be unknown to the hearer, and whose value is supplied by a referential post-copular noun phrase. An analysis of such clauses is straightforward under the assumptions made here. Consider the text in (56).

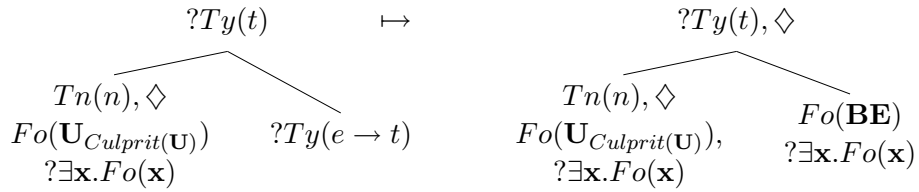
[34]Note that this result is arrived at without actually undertaking any further inference at this point: milk not being a property semantically predicable of a human being and culprit (under assumptions already made) subsumes drinking the last of the milk.

[35]This leaves open the intriguing possibility that the logical relation of identity does not form part of the semantic representation system of natural languages, although it does form part of the interpretation language of that system.

(56) **A**: Where are my socks?
B: The culprit is John.

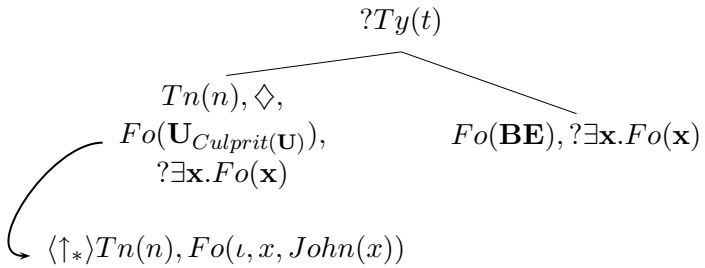
The analysis of B's utterance begins with the parse of the definite noun phrase projecting a metavariable with presupposition as before and shown in the first tree in (57). The current context, however, does not provide provide an obvious substituend for the metavariable and, substitution being an optional process, the pointer moves to the predicate node, licensing the parse of the copula to give the second tree in (57).

(57) Parsing *The culprit is*



The pointer returns to the incomplete subject node. As this is decorated with the bottom restriction, Late*Adjunction cannot apply, but as with equatives discussed in the last section appositive LINK Adjunction can apply. This creates a LINK structure and provides an open type e requirement permitting the parse of *John*, as illustrated in (58).

(58) Parsing *The culprit is John*



Appositive LINK Evaluation then applies to copy the formula projected by the proper name onto that decorated by the metavariable to give the decoration on the subject node shown in (59a). Notice, however, that Term Resolution does not apply here. Indeed, no resolution rule is required at all. This is because metavariables subsume all other formula values ($Fo(\mathbf{U}) \leq Fo(\alpha)$ for all α) and so by copying the value of the LINKed structure onto the host the value for the metavariable is established and no further inference is required. The output value for the subject node in (58) is thus just (59b) and this gives rise to the interpretation of specificational clauses as providing a description referent whose identity is determined by the postcopular noun phrase.

(59) a. $Ty(e), Fo(\mathbf{U}_{Culprit(\mathbf{U})}), Fo(\iota, x, John(x)), [\downarrow]\bot$
b. $Fo(\iota, x, John(x)_{Culprit(\mathbf{U})})$

As before, we need a value for **BE**. In the current context, the most accessible predicate is that of being a culprit: $\lambda x.Culprit(x)$. This has not been used to identify any substituend and there is no other accessible predicate which it subsumes. It, therefore, must be chosen as substituend as shown in (60a) with the formula in (60b) resulting as that for the propositional tree. From which some inference must be made between John's culpability and A's inability to find socks.

(60) a. $\mathbf{BE} \Leftarrow \lambda x.Culprit(x)$

b. $Fo(Culprit(\iota, x, John(x)))$ (= John is a culprit).

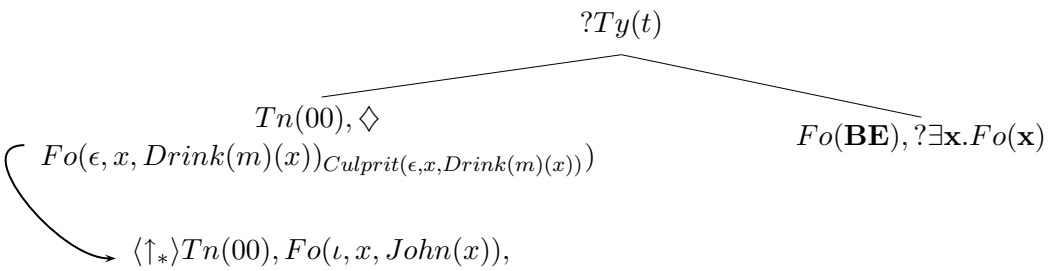
Specificational clauses thus may end up being truth-conditionally equivalent to predicative clauses, but notice that the process by which the interpretation is obtained is distinct. In parsing *John is a culprit*, a term is identified, $\iota, x, John(x)$, and a property, $\lambda x.Culprit(x)$, is predicated of this without need of inference. In parsing *The culprit is John*, on the other hand, the possibility there is someone who is a culprit is presented to the hearer and this someone is identified as John through a process of Appositive LINK Evaluation. The informational effects are thus distinct, with the latter providing focus on *John*, and at the same time (in the current context) providing information that may enable the hearer to find their socks by indicating that somebody may be responsible for wrongdoing with respect to those socks. Process is central to Dynamic Syntax and forms part of the procedural 'meaning' of an utterance without the need to define different representations or layers of information to specifically encode differences in meaning between different constructions.

There is another way in which copular clauses with definite subjects can be analysed given the assumptions of this paper, through substitution of the subject metavariable. Consider in this instance (61).

(61) A: Who's drunk the last of the milk?
B: The culprit is John.

As before, the definite NP is parsed to yield a metavariable with associated presupposition decorating the subject node. In this case, however, a substitution can be made from context: the epsilon term picking out the arbitrary object that is assumed to have drunk the last of the milk. Substitution duly occurs and the copula is parsed. The pointer again goes to the (complete) subject node but as with the equative clause in the last section, Appositive LINK Adjunction applies and the postcopular term *John* is parsed to give the tree in (62).

(62) Parsing *The culprit is John*



Appositive LINK Evaluation decorates the subject node with the formula on the rootnode of the LINKed tree and the two epsilon terms are resolved to one by Term Resolution, exactly as in the equative construction, to give the complex term in (63a). Substitution for $\mathbf{BE}$ may as before be by the predicates $\lambda x.Drink(m)(x)$ or $\lambda x.Culprit(x)$. In this instance, it appears that either predicate may be a substituend, since the presuppositional information about being a culprit need not necessarily have been used. The results of the two substitutions is shown in (63), yielding slightly different interpretations.

(63) a. $Fo((\epsilon, x, Drink(m)(x) \wedge John(x))_{Culprit(\epsilon,x,Drink(m)(x))})$

b. $Drink(m)(\epsilon, x, Drink(m)(x) \wedge John(x))_{Culprit(\epsilon,x,Drink(m)(x))})$

c. $\exists x.Drink(m)(x) \wedge John(x) \wedge Culprit(x)$
There exists someone who is a culprit and who drank the last of the milk and that person is John.

d. $Culprit(\epsilon, x, Drink(m)(x) \wedge John(x)))_{Culprit(\epsilon,x,Drink(m)(x) \wedge John(x)))}$
The person who drank the last of the milk and who is John is a culprit.

Notice that the result may either be like an equative or specificational (predicative) reading. The difference in the former case from *John is the culprit* is again a matter of information structure: *John* being final is necessarily in focus in *The culprit is John* where it is not in the straightforward equative. In this way, I account for the fact that equative and specificational constructions may give rise to quite different interpretations in different contexts (see Heycock & Kroch 1999) but without needing to assume that subtly different readings give rise to (or result from) different representations.

4 Conclusion

In this paper, I have presented a theory of the copula that treats it as providing underspecified semantic content which requires enrichment for interpretation to occur. This enrichment may be provided directly through the parse of expressions that follow the copula or through pragmatic inference over predicates provided by local context. The different analyses of definite and indefinite noun phrases have been shown to affect the way that pragmatic inference may be driven while differences in the way content is derived have been argued to give rise to differences in information content and inferential effect.

There are, of course, many consequences of this approach that remain to be explored. Not least is the way the substitution process works with respect to modal and negative contexts. Clearly in the discourse in (64), although the first conjunct appears to provide the accessible predicate $\lambda x.\neg Happy(x)$ this cannot be substituted for the metavariable projected by *be*.

(64) Sandy isn't happy, but Kim is.
$\vdash$ Kim is happy.
$\nvdash$ Kim isn't happy.

The conclusion must be that *isn't* does NOT project a 'negative predicate' $\lambda x.\neg\mathbf{BE}(x)$ and that *is* must never be associated with a (non-syntactic[36]) negation. There is no accepted theory of negation in Dynamic Syntax (as yet), but the current concerns point to an account like that of Situation Semantics where negation (and affirmation) is treated in terms of a polarity marking (Barwise & Perry 1983). Thus, we may assume that a VP negative introduces a polarity label on the topnode as in (65) which gives rise to analyses such as that in (66) and interpretations such as that in (67).

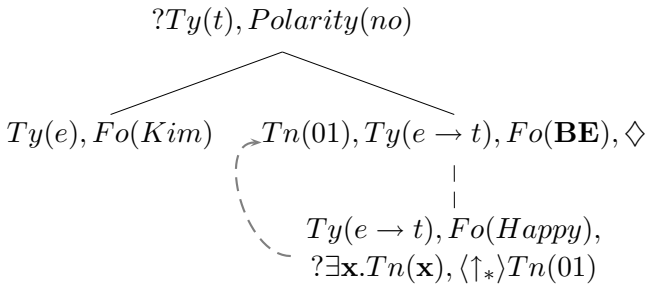
[36]Because of the need to interpret the second conjunct in the following text as *Kim is unhappy* not *Kim is happy*.

(i) Sandy isn't unhappy, but Kim is.

(65)

isn't	IF	$?Ty(e \rightarrow t)$
	THEN	$\mathtt{go}(\langle\uparrow^1_*\rangle), \mathtt{put}(Polarity(no)), \mathtt{go}(\langle\downarrow^1_*\rangle)$
		$\mathtt{put}(Ty(e \rightarrow t), Fo(\mathbf{BE}), ?\exists\mathbf{x}.Fo(\mathbf{x}))$
	ELSE	ABORT

(66) Parsing *Kim isn't*



(67) $< Happy(Kim), no >\vdash \neg Happy(Kim)$

More needs to be said in justification of this approach and the way negation interacts with scope and other aspects of interpretation, but in principle negation (and one would hope, modality) does not undermine the current account of *be*. I take the success in which a uniform view of the copula within Dynamic Syntax leads to successful analyses of the copula in elliptical utterances, existential focus, predicatives, equatives and specificational clauses to support the use of underspecification, both syntactic and semantic, and concepts of pragmatic enrichment as a tool in analysing natural language.

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MAPPING VPS TO RESTRICTORS: ANTI-DIESING EFFECTS IN MANDARIN CHINESE

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1 Introduction*

While many canonical Chinese sentences conform to Diesing's (1992) generalization ('Material from VP is mapped into the nuclear scope'), some non-canonical, though perfectly regular sentence types yield the reverse picture. VPs are regularly mapped to the restrictors of the quantificational structures at hand. The core of the system involves information-structural quantification. Parasitic on this, we find certain kinds of modal quantification.

Almost all of the data in this paper has been taken from Hole (2004), but the emphasis on the parallel quantificational mappings and the comparatively thorough treatment of focus quantification and modality are original to the present paper.

Upon first contact, Mandarin focus marking constructions and modal verb constructions look exactly like their English counterparts. (1) and (2) present two examples.[1]

(1) *Lǎo Wáng zhǐ [hē chá].*
old Wang only drink tea
'Old Wang only drinks tea.'

(2) *Lǎo Wáng bìxū qù dàshǐguǎn.*
old Wang must go.to embassy
'Old Wang must go to the embassy.'

Ignoring subtleties that are irrelevant in the present context, the Mandarin structures and the English renderings are alike. The adverbial focus marker *zhǐ* 'only' in (1) may, just like *only* in

*Despite the somewhat unusual topic of this paper, friends and colleagues have commented extensively on an earlier version. I am very grateful to Volker Gast, Magda Schwager, Andreas Dufter and two anonymous referees for providing me with detailed written comments. Thanks to Jacquelyn Deal for checking my English. Also, I would like to thank the editors/organizers and the participants of the workshop 'Where semantics meets pragmatics', held at the University of Michigan/East Lansing, where an earlier version of the paper was presented. My language consultants were Zhang Jie and Zhang Ning, and I thank them for their patience and attentiveness. I should add, though, that I have not consulted them again before extracting formerly checked data from Hole (2004). The research underlying this paper was partly supported by the *Deutsche Forschungsgemeinschaft* (HO 2557/1–1).

[1]Unless stated otherwise, a bracketed constituent marks the largest possible relevant focus in the sentence at hand.

the translation, relate to a focus maximally as big as the constituent in brackets. The Mandarin sentence in (2) and its English translation are, again, so similar that I feel at a loss as to how to comment on the structures.

Things change dramatically as soon as we turn to the non-canonical patterns that this paper is concerned with. (3) furnishes us with a first idea of these patterns.[2]

(3) a. *Lǎo Wáng zhǐyǒu* [*chá*] *(*cái*) [$_{\text{VP}}$ *hē*].
old Wang only tea CAI drink
'Old Wang drinks only tea.'

b. [There is no p]$_{\text{QUANTIFIER}}$[$p \in$ the set of contextually salient alternative propositions P of (3a)]$_{\text{RESTRICTOR}}$[p is true]$_{\text{NUCLEAR SCOPE}}$.[3]

c. Old Wang drinks tea.

In (3a) the direct object has been preposed, the focus marker has, if compared with (1), been augmented, and an untranslatable, yet obligatory, particle precedes the verb.[4] (3b) is an English paraphrase of (3a) that makes explicit a possible partitioning into quantifier, restrictor and nuclear scope of the focus semantic meaning of (3a). The assertion made by (3a) is given in (3c).[5] The VP in (3a) excludes the focus and is, therefore, plain background together with the subject, which has moved to the leftmost position in the sentence. The opposite was true with adverbial *zhǐ* 'only' in (1), where the VP necessarily contained the focus.

The contrast between (4) (=(2)) and (5) is of a more intricate nature.[6]

(4) *Lǎo Wáng bìxū qù dàshǐguǎn.*
old Wang must go.to embassy
'Old Wang must go to the embassy.'

(5) [*Lǎo Wáng bìxū qù dàshǐguǎn*], *(*cái*) *néng shēnqǐng qiānzhèng.*
old Wang must go.to embassy CAI can apply.for visa
'[Old Wang must go to the embassy] to be able to apply for a visa.'/'Only if [Old Wang goes to the embassy] can he apply for a visa.'/ (good without *cái* if interpreted as two main clauses: 'Old Wang must go to the embassy, he can apply for a visa.')

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[2]Previous important descriptions of *cái* and some or all of the other particles discussed in this paper include Alleton (1972), Paris (1981) and Biq (1984, 1988).

[3]It is not at all uncontroversial, or even broadly discussed, exactly how focus-background structures are mapped to tripartite quantificational structures. Section 7 is dedicated to this problem. At that point I justify why I make use of (a refined version of) the format chosen in (3b).

[4]The augmented focus marker *zhǐyǒu* is used whenever the focus marker is not in the adverbial position exemplified in (1). Historically, it may be analyzed as 'only' + 'exist', cf. *yǒu* 'have, exist', but a biclausal cleft-analysis for the Chinese sentence in (3a) is, at least synchronically, not feasible. See Hole (2004:272f) for more details.

[5]As von Fintel (1994:133) puts it, 'there is an industry devoted to the issue of whether the latter ingredient [i.e., the proposition in the scope of *only*; D.H.] is an implicature (conversational or conventional), a presupposition, or part of the truth conditions. And these days, it is also possible that it is an explicature in the sense of the London school of pragmatics.' I side with the truth-conditional faction, but for the aims of this paper nothing really hinges on this. In what follows, I will refer to the propositions in the scope of 'only'-words as 'asserted'. For an in-depth survey of the theories that researchers defend concerning the status of these propositions, see Horn (1996).

[6]Dotted underlining as in (5) marks a constituent as necessarily unfocused.

Both sentences have the same modal force; they involve propositions under a necessity operator. The first translation of (5) reflects this fact, but at the cost of obscuring the syntactic facts of subordination. In terms of syntax, the righthand clause of (5) is superordinate, and this fact is preserved more accurately in the second translation of (5). In section 8 we will have an opportunity to understand this sentence type more thoroughly; at the present stage the non-native reader will have to take my word for it that we are really dealing with subordination of the *bìxū*/'must'-clause on the one hand, but that, on the other hand, the overall modal force of the complete complex sentence is necessity, and not possibility as suggested by the occurrence of *néng* 'can' in the righthand matrix clause.

An obvious parallel between (3) and (5) is the fact that both sentences contain the particle *cái*. The generalization that I want to arrive at is that all sentences with particles belonging to the same class as *cái* encode quantificational structures in which the VPs behind the particles are mapped to the restrictors of the quantificational structures at hand. (I will continue to refer to the predicates following *cái* and the other particles as 'VPs', even though they should probably be classified as 'aspect phrases' or 'non-epistemic modal phrases' (Shyu 1995).) This forms a sharp contrast with the VPs of canonical sentences, both in English and in Mandarin (Diesing 1992; Tsai 1994). Just as the VP of *Every boy eats chocolate* is mapped to the nuclear scope of the encoded quantificational structure, the VPs of modalized sentences are canonically mapped to the nuclear scope. This is illustrated in (6) and (7).

(6) a. Every boy eats chocolate.

b. $\forall x[x \text{ is a boy}]_{\text{RESTRICTOR}}[x \text{ eats chocolate}]_{\text{NUCLEAR SCOPE}}$

(7) a. Old Wang must go to the embassy.

b. $\forall w[w$ is a world maximally similar to the ideal worlds in terms of the ordering source at hand, say, worlds in which things only happen the way required by the regulations for the issuing of visas$]_{\text{RESTRICTOR}}$[Old Wang goes to the embassy in $w]_{\text{NUCLEAR SCOPE}}$

The reader with some background knowledge in the modeling of modality will have noticed that my quantificational paraphrase of (7a) in (7b) relies (in a simplified way) on Kratzer's (1981; 1991a) theory of modality. Familiarity with Kratzer's approach will certainly make sections 8 and 9 of the present paper more readily accessible; my application of Kratzer's theory will not be fully explicit, though, and I will explain things in natural language whenever I make use of notions from her theory. At the present point it suffices to know that, just as in other model-theoretic approaches to modality, necessity is identified with universal quantification over possible worlds (and possibility with existential quantification).

The notion of ordering sources plays a crucial role in Kratzer's theory. Ordering sources result in partial orderings on possible worlds which allow one to determine the similarity of any given possible world with a possible world that is ideal with respect to some property. The ordering source referred to in (7b) is the degree of similarity with those worlds in which only things are the case that conform to the real-world regulations for the issuing of visas.

Let us now turn to the peculiar function of words like *cái* as in (3) in some more detail (sections 3 through 7) before returning to the intricacies of the complex modal structures parasitic on the *cái*-like particles in sections 8 and 9. For better orientation and navigation, Table 1 presents the overall plan of the paper. Shaded cells highlight sections with an emphasis on empirical breadth. Cells delimited by thicker lines correspond to those sections that constitute the theoretical backbone of the paper.

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Table 1: Plan of the paper

2 Non-canonical structures I: Conventionalized focus-background agreement

We have seen above that (i) dropping *cái* influences grammaticality, and that (ii) it is impossible to render its function in an English translation. The relevant examples contrasting canonical adverbial focus-sensitive particles with non-canonical foci co-occurring with *cái* are repeated in (8).

(8) a. *Lǎo Wáng* (*zhǐ*) *hē chá.*
old Wang only drink tea
'Old Wang (only) drinks tea.'

b. *Lǎo Wáng zhǐyǒu chá* *(*cái*) *hē.*
old Wang only tea CAI drink
'Old Wang drinks only tea.'

The same contrast recurs with 'even'-foci; cf. (9).

(9) a. *Lǎo Wáng* (*shènzhì*) *bù hē chá.*
old Wang even not drink tea
'Old Wang doesn't (even) drink tea.'

b. *Lǎo Wáng lián chá* *(*dōu*) *bù hē.*
old Wang even tea DOU not drink
'Old Wang doesn't even drink tea.'

Just as with *zhǐ* 'only' in (8), the adverbial focus marker *shènzhì* 'even' in (9a) may be dropped without influencing grammaticality, while the *lián*-marked preposed object in (9b) goes hand in hand with the obligatory preverbal particle *dōu*.[7]

[7]This *dōu* is diachronically related to the comparatively well-known distributive *dōu* 'each' as, for instance, studied by Lin (1996, 1998), but it cannot be identified with it at a synchronic level. See Hole (2004:ch. 4.3.1) for the

The generalization in (10) holds in the overwhelming majority of cases.

(10) If a focus that is marked for a specific type precedes the VP, a particle at the left edge of the VP must be used.

Since the particles at the left edge of the VP co-vary with the semantic type of focus preceding the VP, the resulting system may be analyzed as an agreement mechanism.

(11) Backgrounded VPs agree with their preceding foci. The agreement morphemes are the particles at the left edge of the VP, and the agreement categories are the different kinds of focus for which the preceding foci are marked (e.g., 'only'-foci or 'even'-foci).

I review the few exceptions to (10) and (11) in Hole (2004:52,72,174), but they don't seem to threaten the validity of the generalizations in a serious way. Note in passing that the marking of the preverbal foci may be implicit as in (12), but that this doesn't undermine (11). (This is not to say that the foci in (12) are not marked as such by prosodic means. What matters is that there are no pronounced segments in (12) which may be analyzed as focus markers.)

(12) a. *Lǎo Wáng* [*chá*] *cái hē.*
old Wang tea CAI drink
'Old Wang drinks only tea.'

b. *Lǎo Wáng* [*chá*] *dōu bù hē.*
old Wang tea DOU not drink
'Old Wang doesn't even drink tea.'

The only alternative to assuming implicit or contextual focus marking in (12) would be to say that *cái* and *dōu* themselves are the focus marking devices. This would leave us with an undesirable homonymy stipulation for the particles; they would be agreement particles in (8b) and (9b), but focus markers in (12).

The generalizations in (10) and (11) are not just valid for direct objects and other canonically postverbal material. They likewise apply to elements that never occur in postverbal positions to begin with. (13) provides two examples involving complex sentences.

(13) a. *Zhǐyǒu* [*Lǎo Wáng lái*], *wǒ* *(*cái*) *qù.*
only.if old Wang come I CAI go
'Only if [Old Wang comes] will I go.'

b. *Jíshǐ* [*Lǎo Wáng lái*], *wǒ* *(*dōu*) *qù.*
even.if old Wang come I DOU go
'Even if [Old Wang comes], I will go.'

---

detailed justification for keeping the two uses of *dōu* apart. The most important argument for a strict separation of the distributivity marker and the focus-related *dōu* under scrutiny here is that distributive *dōu* must be preceded by an XP with a(n inherently) plural denotation. No such restriction is active with the *dōu* studied here, at least not if only the ordinary meaning to the exclusion of the focus meaning (in the sense of Rooth 1985) is taken into account. We will see below that our *dōu* indeed interacts with the pluralities in the focus meanings of the sentences in which it occurs.

Over the past decade, syntacticians from the generative tradition have come up with several minimalist accounts to get a grip on the syntax of this construction (Gao 1994; Shyu 1995; Zhang 1997, 2000). However, the feature checking analyses that were formulated leave open the question of what makes the observed system a system from the point of view of function or semantics. This is the question that I have addressed in some detail in Hole (2004).

To conclude the present section, I will give a summary of the overall architecture of this sub-system of Mandarin grammar. I will then (sections 3–6) move on to describe each focus quantificational type in turn, and I will aim at justifying the arguably most controversial type of conventionalized focus quantification that I propose, viz. negated universal quantification over alternatives. Readers with a less urgent interest in the empirical unfolding of the Mandarin system and with a prevalent curiosity about the mapping of focus-background structures to quantificational structures may skip the following data-oriented sections (except, perhaps, for the section on *jiù*, viz. section 5) and continue with section 7.

A summary of major features of the focus quantificational system of Mandarin focus-background agreement is given in (14).

(14) a. Each classic quantificational type (∃, ∀, ¬∃, ¬∀) constitutes a basic agreement category in Mandarin focus-background agreement.

b. Each focus quantificational type is covered by a distinct agreement marker.

c. Negated universal quantification (¬∀) forms an integral part of this system, despite claims found in the literature that this type of quantification does not conventionalize/hardly ever conventionalizes.

3 Negated existential quantification over alternatives (¬∃)

Negated existential quantification is the focus type which triggers the use of *cái*. No contextually salient alternative is true. The most important relevant focus marker in English is *only*. In the formal semantics tradition, the special focus semantics of this focus type is usually characterized in a different way, viz. as a kind of universal quantification. In that tradition the 'only'-entailment is expressed by formulae which state roughly the following: All the true alternatives to the assertion must be identical with the assertion. I will return to the difference between these traditions in section 7. There I will also defend why I make use of the more traditional quantificational format involving negated existential quantification.

In most cases, translations of sentences with *cái* into English will make use of words like *only*, *merely*, etc.; moreover, *not…until*-sentences belong in this domain.

(15) presents some Mandarin sentences whose foci trigger the obligatory use of *cái*. Each example is supplemented by a rendering which makes the respective focus semantic component of meaning explicit.

(15) a. PREPOSED OBJECT IN FOCUS

Lǎo Wáng zhǐyǒu [*chá*] *(*cái*) *hē*. (=(3a),(8b))
old Wang only tea CAI drink
'Old Wang drinks only tea.'

a′. 'There is nothing, apart from tea, that Old Wang drinks.

b. SUBORDINATE CLAUSE (PARTIALLY) IN FOCUS

Zhǐyǒu [*Lǎo Wáng lái*], *wǒ* *(*cái*) *qù*. (=(13a))
only.if old Wang come I CAI go
'Only if [Old Wang comes] will I go.'

b′. 'There's no condition, apart from Old Wang coming, under which I will go.'

c. TIME ADVERBIAL IN FOCUS

Xiǎo Wáng zhídào [*bā-diǎn*] *(*cái*) *lái.*
little Wang until 8-o'clock CAI come
'Little Wang only came at eight o'clock.'/'Little Wang did not come until eight o'clock.'

c′. 'There is no point in time, apart from eight o'clock (and trivial later points in time), such that Little Wang came at that point in time or before that.'[8]

For more details, especially concerning Mandarin 'only-if'-conditionals and constructions with 'until'-foci or temporal 'only'-foci, cf. Hole (2004:121–38).

4 Universal quantification over alternatives (∀)

As seen in (9b) and (13b), 'even(-if)'-constructions fall under that focus-semantic category which is agreement-marked by *dōu*. The proper treatment of 'even'-foci has been a recurrent topic over the past two or three decades. Krifka (1995) has – in my eyes, convincingly – corroborated the claim that universal quantification over focus alternatives is the right quantificational notion to deal with 'even'-constructions. Thus, a sentence like *John doesn't even eat chicken meat* will presuppose that John doesn't eat any of the contextually salient kinds of meat either, say, beef, or pork. The way in which 'even'-foci are treated by the grammar of Mandarin underpins Krifka's claim, because 'even'-foci are reliably marked by *dōu* (or *yě*; see section 7). The two other large areas where *dōu* marks backgrounded VPs are, (i), constructions with (strong) negative polarity items (cf. (16)) and, (ii), constructions with free-choice items (cf. (17)).

(16) a. SMALLEST-QUANTITY PREDICATES AS NPIS (*penny*/*dime*-type NPIS)

Lǎo Wáng yī-[*dī*] *jiǔ* *(*dōu*) *méi* *hē.*
old Wang 1-drop wine DOU not.have drink
'Old Wang hasn't had a [drop] of alcohol.'

b. INDEFINITE PRONOUNS AS NPIS (*anything*-type NPIS)

Lǎo Wáng [*shénme*] *(*dōu*) *bù* *chī.*
old Wang anything/what DOU not eat
'Old Wang doesn't eat [anything at all].'

[8]This paraphrase presupposes a specific analysis of the denotation of temporal adverbials as in (15c). The basic idea developed in Hole (2004:126–9) is that all adverbial temporal *cái*-foci, and not just the ones marked by *zhídào* 'until', must be analyzed as relating to the set of points in time before and including the point in time overtly mentioned. This analysis strives to solve one half of the long-standing paradoxes tied to scalar words like *erst* 'only, not…until' in German (cf. König 1979; Löbner 1989).

Both negative polarity constructions and free-choice constructions can be shown to involve universal quantification over focus alternatives. The propositions underlying each sentence in (16) are semantically stronger than any relevant alternative propositions that have a semantically more specific term in the position of the NPIs. If Old Wang, as in (16a), doesn't drink a drop of alcohol, any other quantity is likewise excluded as being consumed by him, simply because any alternative quantitity will be larger than one drop, and any assertion of a proposition with such a larger amount of alcohol instead of 'one drop' is already entailed by the assertion of (16a). In Krifka's theory, an NPI like *shénme* 'what/anything' as in (16b) denotes 'λx.x is a thing', i.e. the most general property that any thing has. Therefore, if Old Wang in (16b) doesn't eat anything that has the property of being a thing, he doesn't eat anything at all, because every alternative nominal predicate will entail that property. In both cases, the assertion allows us to make a statement concerning all relevant alternative propositions, viz. that they are all true. In line with the tradition starting with Ladusaw (1979) and defended by Heim (1984), the restricted distribution of NPIs is thus made to follow from the monotonicity behavior of contexts in which NPIs may occur.

The case of free-choice items as illustrated in (17) is different.[9]

(17) a. INDEFINITE PRONOUNS AS FREE-CHOICE ITEMS

*Wúlùn shéi *(dōu) lái.*
no.matter who DOU come
'No matter who, everyone comes.'

b. A-NOT-A-QUESTION DISJUNCTIONS AS FREE-CHOICE ITEMS

*Lǎo Wáng bùguǎn xià bu xià yǔ *(dōu) huì lái.*
old Wang no.matter fall not fall rain DOU will come
'Old Wang will come, no matter whether it's raining (or not).'

In these cases the set of alternative propositions is not characterized by different, that is, stronger predicates than the highly general predicates 'λx.x is a human' for *shéi* or 'λx.x is a thing' for *shénme* as with the NPIs in (16); instead, all the possible different propositions resulting from (arbitrarily) fixing the referent of the pronominal in (17a) define the relevant domain of quantification. If the model with respect to which (17a) is interpreted contains the individuals John, Bill and Mary, then (17a) will say that, e.g. *John comes* is true, but that *Bill comes* and *Mary comes* would likewise have been true; or that (if the reference of the free-choice item is fixed differently) *Bill comes* is true, but that *Mary comes* and *John comes* would likewise have been true; or that, finally, *Mary comes* is true, but that *John comes* and *Bill comes* would likewise have been true. If we interpret the focus accent on the free-choice item in (17a) as being a focus on the choice function (cf. von Heusinger 2002), with this focus relating to alternative choice functions that could have been selected to assign the variable a value, then it becomes clear why the kind of quantification at hand is a sub-type of focus quantification.

Admittedly, the above reasoning is just an outline of an analysis that subsumes Mandarin free-choice sentences as in (17a) under a more general focus semantic analysis. If it were to be

[9]Never mind the fact that both *shéi* in (17) and *shénme* in (16) belong to the same class of indefinite pronouns in Mandarin. In Hole (2004:223) I present evidence to the effect that the Mandarin negative polarity construction with indefinite pronominals must be kept strictly separate from Mandarin free-choice constructions with indefinite pronominals.

spelled out in an explicit syntax-semantics framework à la Heim & Kratzer (1997), one would have to implement the choice function as a constituent of its own such that it alone may be focused and relate to alternative choice functions.

Although seemingly different, the disjunctive case in (17b) is entirely parallel. Note for a start that the basic kind of *yes*/*no*-question formation in Mandarin is disjunctive. (18) provides an example.

(18) *Nǐ qù bu qù?*
you go not go
'Are you going?'

In correspondence with a Hamblin-style semantics of questions (Hamblin 1973), *yes*/*no*-questions are formed by juxtaposing representatives of the possible answers, namely the negated and the non-negated predicates. This kind of juxtaposition behind *wúlùn* 'no matter' in (17b) has the very same function as the free-choice item *shéi* in (17a); the positive or the negative value may be chosen, but only one. Whichever value is chosen, the assertion will always come out true and this, again, boils down to universal quantification over alternatives.

This concludes the small survey of sub-kinds of universal quantification over focus alternatives in Mandarin which trigger the use of *dōu*. Let us now turn to the interesting and potentially more controversial case of negated universal quantification over alternatives.

5 Negated universal quantification over alternatives (¬∀)

5.1 Basic facts

The right-hand lower O corner of the classic square of opposition is the step-child of traditional theories of quantification. Horn (1972) was among the people to notice the fact that negated universal quantification rarely finds conventionalized lexical expression. Sequences of quantifiers like English *not all* do not lead to complex quantifiers of the type **nall*, even though contractions in the domain of quantifiers expressing negation plus something else are the diachronic norm in Germanic languages. Two kinds of research traditions in this domain may be distinguished. One line of argumentation says that there is something wrong with the traditional square of opposition, and that the lack of quantifiers like **nall* is to be expected, because the required type of quantification can be reduced to something else. Such an analysis has recently been formulated by Seuren (2003). The other tradition will say that the square of opposition is fine the way it has been handed down to us from Aristotle, Boethius and the Middle Ages, but that independent factors render the quantificational type 'not all' unnecessary or dysfunctional in most natural language interactions. This dysfunctionality or rareness of use obstructs lexicalization processes. Horn (1989, 2005) is a proponent of such a 'good idea – no gain' approach to the lexical gap in the square of opposition. He couches his argumentation in the context of neo-Gricean implicature reasonings, complemented by an empirically well-grounded principle which gives precedence to the lexicalization of non-negated terms over the lexicalization of negated ones. Lexicalization of existential quantification, complemented by analytically expressed inner negation, will yield the O-type of quantification if needed, because ∃¬-type quantification is equivalent to ¬∀-type quantification. Moreover, and this is where the neo-Gricean tradition kicks in, most contexts of use will simultaneously allow for the two competing quantificational statements *Some x's are y* (existential quantification, or the lower left-hand I corner of the square of opposition) and *Not*

all x's are y; the contexts in which only ¬∀ is true are negligible from the point of view of lexicalization needs. Löbner (1990) has independently demonstrated that the lexicalization gap in the ¬∀-corner is just a matter of degree, and he collects several four-membered lexical fields covering each corner of the square of opposition.[10]

5.2 Negated universal quantification and focus semantics

One of the aims of this article is to add plausibility to the Horn-Löbner position, and to discredit the idea that the square of opposition is a flawed construct. I would also like to demonstrate that what is a negligible quantificational option in some empirical domain of quantification is a highly natural one in another.

What would negated universal quantification over focus alternatives amount to? Let us imagine a discourse in which the eating habits of your little nephew are discussed. You want to cook some vegetables for him, but it turns out he likes neither broccoli nor spinach, and he doesn't like bell peppers either. You may ask *What do you like then?* in this situation, and your nephew may reply as in (19a).

(19) a. I like carrots. I like tomatoes, too.

b. I like carrots, poo.

What (19a) leaves open is whether apart from carrots and tomatoes there are other vegetables that he likes. The presupposed information tied to the use of *too* in this context is that, apart from tomatoes, at least one more kind of vegetable is already in the background as a kind of vegetable that he likes (namely, carrots). (19b) contains the non-existing particle *poo*. It is meant to capture that presupposition that negated universal quantification over alternatives would amount to. By using it, your nephew would relate back to the information already established, namely that he doesn't like broccoli, spinach, and bell peppers. What it leaves open, though, is whether there are other kinds of vegetables apart from carrots that he likes to eat. Gast (2004) claims that English *at least*, in one of its uses, carries such a presupposition in addition to some scalar component of meaning. Note that such a focus quantificational type is not useless if compared with the existential type instantiated by *too*. It is, in fact, more informative in one respect than *too* (or, to be more precise, it presupposes more information in one respect). *Poo* necessarily separates the domain of alternatives (including the asserted alternative) into complementary subsets, because not all alternatives are the same. *Too* leaves open the possibility that all alternatives are alike. *Poo* is not just another way of relating to a background that would also be compatible with *too*. *Too* says that the information in the assertion is in line with some presupposed bit of information. *Poo* does the exact opposite; it relates back to information that is *not* in line with the assertion. Seen from this angle, the big difference between *too* and *poo* on the one hand, and *only* and *even* on the other, is that *only* and *even* warrant statements about all alternatives, whereas *too* and *poo* only warrant statements about some alternative(s).

[10] Examples from German include the two quadruples in (i) and (ii) (Löbner 1990:89):

(i) *ermöglichen – erzwingen – verhindern – erübrigen*
'make possible – enforce – obviate – render unnecessary'

(ii) *möglich – sicher – ausgeschlossen – fraglich*
'possible – sure – impossible – questionable'

5.3 Negated universal quantification and Mandarin information-structure

If a *poo*-type focus semantics can be defended as a possible kind of relating asserted information to the background on general grounds, and if it is less extreme in the requirements that it puts on the set of alternatives than, say, *only*, we will expect to find a relatively high token frequency of the respective focus type in languages in which it is conventionalized. The Mandarin particle *jiù*, which I claim to be the background marker of ¬∀-focus semantics, in fact has the highest token frequency in texts and conversations among the four particles investigated here and in Hole (2004).

Here are two Mandarin examples that give us a first impression of how *jiù*-sentences work.

(20) a. *Ōuzhōu rén dāng zhōng,* [*Ìdàlì rén*] *jiù zhǎng-zhe hēi tóufa.*
Europe people among Italy people JIU grow-ASP black hair
'Among Europeans, [Italians] have black hair.'

b. *#Dōng-Yā rén dāng zhōng,* [*Rìběn rén*] *jiù zhǎng-zhe hēi tóufa.*
east-Asia people among Japan people JIU grow-ASP black hair
'Among the people from East Asia, the [Japanese] have black hair.'

(20a) is fine, because among the alternatives that are explictly referred to, there are peoples whose members are generically said to have fair hair, say, Norwegians (let's disregard the true proportion of fair-haired people among Norwegians for the sake of the argument and stick to the stereotype). (20b) is infelicitous, and this fits in well with our theory about *jiù*, because we know that among the competitors from East Asia, all others (stereotypically) have black hair, too. One might object now that this minimal pair relies on a rare kind of discourse setting, and that not many situations will arise in which sentences like (20a) with the required focus-background structure are uttered. This is true, and the real domain of application for our allegedly exotic focus type is somewhere else, viz. in the domain of contrastive topics. Look at (21), in which the contrastive topic and the focus have been marked.

(21) *Rúguǒ xīngqītiān tiānqì* [*hǎo*]$_{\text{CT}}$, *wǒ jiù* [*qù pá shān*]$_{\text{F}}$.
if Sunday weather good I JIU go climb mountain
'If the weather is [fine]$_{\text{CT}}$ on Sundays, I [go mountain climbing]$_{\text{F}}$.'

(21) is uttered by a passionate mountain climber, and the sentence, with the indicated information structure and uttered in a suitable context, amounts to the following: (i) The speaker goes mountain climbing on Sundays if the weather is fine, (ii) he may go mountain climbing if the weather is not 100 per cent fine, but (iii) not all weather conditions are such that he will go mountain climbing on Sundays, e.g. if there is a snow-storm, or heavy rain. (i) is the assertion of (21), (ii) is what is left open by the conditional semantics induced by *rúguǒ*/*if*-subordination, and (iii) amounts to the information-structural component of meaning brought into the sentence by the contrastive topic accent on *hǎo* 'good', and reflected by agreement *jiù*. At an intuitive level, the relation between contrastive topics and negated universal quantification over alternatives seems straightforward. But to make the link explicit turns out not to be so easy.

5.4 Problems with contrastive topics

It is not quite clear whether contrastive topics, just by themselves, generally presuppose the falsity of an alternative proposition that differs in the position of the contrastive topic. Imagine a context in which a teacher has a pile of students' essays on his desk, and he must evaluate them all. He grades the first one, and it is really good. The teacher says to himself: *The* $[$*first*$]_{\mathrm{CT}}$ *one was* $[$*really good*$]_{\mathrm{F}}$. If later on it turns out that all essays are really good, this doesn't make his statement, which was uttered after the first essay, infelicitous. This seems to support the idea that contrastive topics do *not* carry a presupposition to the effect that one alternative is false. But this conclusion is too hasty. Our teacher made his statement at a point when he wasn't fully informed about the quality of all papers. His natural assumption at this point was most likely that not all other papers are equally good. Let us, therefore, change the context in such a way that the teacher grades all papers first, and they are all really good. He starts to copy the grades (only As and Bs) into his notebook, and if now he says to himself *The* $[$*first*$]_{\mathrm{CT}}$ *one was* $[$*really good*$]_{\mathrm{F}}$, this is odd. With the complete information about the comparable quality of all other papers, the contrastive topic is no longer felicitous. A single focus accent on *first* would, on the other hand, not be infelicitous, and a statement to the same effect for all other papers is possible (*The* $[$*second*$]_{\mathrm{F}}$ *one was really good, The* $[$*third*$]_{\mathrm{F}}$ *one was really good, . . . The* $[$*last*$]_{\mathrm{F}}$ *one was really good,* $[$*All*$]_{\mathrm{F}}$ *were really good*). So there does seem to be a difference between foci and contrastive topics as regards the exclusion of at least one alternative. Still, this conclusion may again be too hasty. If the general idea of Büring's (2003) approach to contrastive topics as discussed below is on the right track, and if, specifically, contrastive topics always signal that at least one more assertion with another contrastive topic precedes or follows an utterance with a contrastive topic in an ideal discourse, then a less direct explanation becomes feasible. According to such a view, contrastive topics just seem to presuppose the falsity of at least one alternative because if no alternative was wrong, the simpler focusing strategy without contrastive topics could have been chosen.

I will not favor either solution here as far as a general theory of contrastive topics is concerned. As to the kinds of discourses which trigger the use of *jiù* in Mandarin I will, however, be more explicit. If *jiù* has the grammatical kind of function that I claim it has, then contrastive topics triggering the use of *jiù* must carry a presupposition to the effect that not all alternatives are true.

A second problem has to do with the very fact that *jiù* is triggered by a contrastive topic, and not by a focus. This is not a trivial problem if the idea of negated universal quantification over alternatives is to be combined with the account of contrastive topics developed by Büring (1997, 2003). The matter will ultimately be left unsettled, but I will nevertheless try to say how Büring's account of contrastive topics would have to be amended to fit in with the special kind of contrastive topics under scrutiny here, viz. those that trigger the use of *jiù*.

In Büring's system, contrastive topics are a kind of second-order foci. A contrastive topic doesn't relate to a set of alternative propositions, but to a set of sets of alternative propositions. What is meant by this? Take the sentence in (22a) and its Rooth-style focus meaning in (22b).[11]

[11]The f-marked brackets symbolize that interpretation function which yields Rooth's (1985) focus meanings. A focus meaning is a set of expressions that are type-identical with the ordinary interpretation; the members of this set differ only in the position of the focus. We will return to p-set formation repeatedly below. The index *C3* in (22b) restricts the set of alternative propositions to the ones that are relevant in the context under discussion here.

(22) a. Paul $[$goes mountain climbing$]_{\mathrm{F}}$.

b. $[\![(22)]\!]^{f}_{C3}$ = {*Paul goes mountain climbing*, *Paul goes bird watching*, *Paul stays at home and rearranges his stamp collection*, *Paul plays the flute*}

With a focus as indicated in (22a), this sentence may have the contextually restricted focus meaning in (22b), viz. a set of propositions that may differ from the assertion only in the position of the focus. The denotation of the question *What does Paul do?* in a Hamblin-style semantics of questions (Hamblin 1973) looks the same. In other words, focus meanings correspond to denotations of questions.

Contrastive topics have a recursive focus denotation. Büring's rule of CT-/contrastive topic-value formation is given in (23) (Büring 2003:519; the formal definition is found on p. 539).

(23) CT-value formation:
step 1: Replace the focus with a *wh*-word and front the latter $[\ldots]$.
step 2: Form a set of questions from the result of step 1 by replacing the contrastive topic with some alternative to it.

Let us apply this procedure to the sentence in (24a).

(24) a. If the weather is $[$fine$]_{\mathrm{CT}}$ on Sundays Paul $[$goes mountain climbing$]_{\mathrm{F}}$.

b. step 1: What does Paul do if the weather is $[$fine$]_{\mathrm{CT}}$ on Sundays?
step 2: {*What does Paul do if the weather is fine on Sundays?*,
What does Paul do if the weather is really bad on Sundays?,
What does Paul do if the weather is neither good nor bad on Sundays?}

Büring's main claim concerning the felicity of a sentence with a C-topic is that all of the questions that we got as a result of applying step 2 of (23) must be 'under discussion' or, in the terminology of Büring (2003), that a sentence with a C-topic must 'indicate a strategy'. 'Indicating a strategy', means what was just said, viz. that the surrounding (idealized) discourse contains other questions and other answers which only differ in the positions of the foci and the C-topics and which fully exhaust the super-question under discussion. A plausible super-question in our context would be something like *What does Paul do on Sundays?* The set of sub-questions is defined by bringing the weather conditions into play, and the resulting set of sub-questions has been given in (24b), step 2. And, indeed, uttering (24a) seems to require a surrounding discourse like one in which the questions of (24b), step 2, are answered one after the other. If questions denote sets of possible answers, then we can rewrite the result of applying step 2 of CT-value formation in (24) as in (24b′), step 2.

(24) b′. step 2: {{*If the weather is fine on Sundays Paul goes mountain climbing*,
If the weather is fine on Sundays Paul goes bird watching,
If the weather is fine on Sundays Paul stays at home and rearranges his stamp collection,
If the weather is fine on Sundays Paul plays the flute},
{*If the weather is really bad on Sundays Paul goes mountain climbing*,
If the weather is really bad on Sundays Paul goes bird watching,
If the weather is really bad on Sundays Paul stays at home and rearranges

his stamp collection,
If the weather is really bad on Sundays Paul plays the flute},
{*If the weather is neither good nor bad on Sundays Paul goes mountain climbing,*
If the weather is neither good nor bad on Sundays Paul goes bird watching,
If the weather is neither good nor bad on Sundays Paul stays at home and rearranges his stamp collection,
If the weather is neither good nor bad on Sundays Paul plays the flute}}

If (24b′), step 2, is what Büring calls the CT-value of (24a) in an appropriate discourse context, then it should *mutatis mutandis* also be a possible CT-value of our Mandarin example (21), repeated here as (25).

(25) *Rúguǒ xīngqītiān tiānqì* [*hǎo*]$_{CT}$, *wǒ jiù* [*qù pá shān*]$_{F}$.
if Sunday weather good I jiu go climb mountain
'If the weather is [fine]$_{CT}$ on Sundays, I [go mountain climbing]$_{F}$.'

Now, the problem is as follows: if the CT-value of (25) is as in (24b′), step 2, then negated universal quantification over alternatives cannot "see" the right kind of entity. Since the CT-value consists of *sets*, quantificational procedures which take these sets as inputs will not allow for statements about individual propositions. What we need is a statement to the effect that the intersection of the true propositions with the alternative propositions has at least one member less than the set of alternative propositions. But we have no set of alternative propositions in the CT-value, we only have a set of sets of propositions. If we were somehow allowed to form the generalized union over the CT-value we would arrive at the right kind of object. The generalized union of the CT-value of (25) is given in (26).

(26) {*If the weather is fine on Sundays Paul goes mountain climbing, If the weather is fine on Sundays Paul goes bird watching, If the weather is fine on Sundays Paul stays at home and rearranges his stamp collection, If the weather is fine on Sundays Paul plays the flute,*
If the weather is really bad on Sundays Paul goes mountain climbing, If the weather is really bad on Sundays Paul goes bird watching, If the weather is really bad on Sundays Paul stays at home and rearranges his stamp collection, If the weather is really bad on Sundays Paul plays the flute,
If the weather is neither good nor bad on Sundays Paul goes mountain climbing, If the weather is neither good nor bad on Sundays Paul goes bird watching, If the weather is neither good nor bad on Sundays Paul stays at home and rearranges his stamp collection, If the weather is neither good nor bad on Sundays Paul plays the flute}

This is a step ahead, because now we simply have the set of alternative propositions that formerly made up the sub-sets of the CT-value (I have retained the paragraphs of the original CT-value in (24b′), step 2, for perspicuity only). This conforms to the focus meaning of a sentence with two foci. Now the proposition that we would minimally want to sort out under the assumption of ¬∀-type quantification and given a plausible context (*If the weather is really bad on Sundays Paul goes mountain climbing*) is readily accessible, because the contrastive topic is treated like a focus.

But (26) is not without problems, either. Other propositions which we definitely do not want to be possible singular candidates of exclusion are likewise accessible. As the set of propositions in (26) stands, nothing prevents the exclusion of, say, the second proposition of the first paragraph of propositions in (26) (*If the weather is fine on Sundays Paul goes bird watching*). But this doesn't conform to the intuitions that speakers report for (25). If a single alternative is excluded to conform to the ¬∀-requirement of the information-structural category triggering the use of *jiù*, then this alternative should differ from the asserted proposition in the position of the C-topic. Only propositions with an alternative to *fine* weather should be considered, i.e. propositions from paragraph 2 or 3 in (26), and it should be excluded that Paul goes mountain climbing under these alternative weather conditions. This problem of over-generation is easily fixed, though. The alternatives that may be considered for possible exclusion should not be of such a kind that they contradict the asserted proposition to begin with. Put differently, propositions that contradict the assertion should be sorted out from the set of alternatives/the generalized union of the CT-value before ¬∀-quantification applies. We only want information-structural quantifiers to sort out alternatives that aren't trivially sorted out anyway by just looking at the entailments of the assertion. A conditional like *If the weather is fine on Sundays, I (always) go mountain climbing* entails, on its strict reading, the falsity of sentences like *If the weather is fine on Sundays, I (always) go bird watching*, or *If the weather is fine on Sundays I (always) stay at home and rearrange my stamp collection*. This means that the first paragraph of alternatives from (26) is eliminated from consideration for the exclusion of at least one alternative.

With these provisions added, contrastive topics and *jiù*-type information-structure appear compatible. What I must leave for another occasion is the matter of comparing contrastive-*jiù*-topics as modeled here with Büring-style contrastive topics more thoroughly. It would be interesting to check in more detail how the empirical advantage of Büring's layered CT-values (cf. Büring 2003:521–2) are compensated in the system favored here in which a flat set of alternatives is supplemented by a more restrictive way of delimiting the set of alternative propositions that are relevant in a given sentence with a contrastive topic and a focus. The goal in the present paper could only be to show the general plausibility of an attempt to reconcile negated universal quantification over alternatives with contrastive topichood.

5.5 *Jiù* and the **nall*-constraint

Let's briefly return to the frequently observed lexicalization gap in the ¬∀-corner of the square of opposition, the **nall*-constraint. In Hole (2004:70–1) I discuss the lack of uncontroversial focus markers triggering the use of *jiù*. *Jiù*, itself being an agreement marker, is hardly ever used with focus or contrastive topic markers preceding the focus or contrastive topic (cf. (20) and (21), where no such focus marker is used, either). That is, ¬∀-focus quantification is not typically marked overtly; it is just the agreement marker that finds conventionalized expression. Viewed from this angle, the **nall*-constraint has its repercussions in Mandarin, but only in the domain of focus marking, and not in the domain of focus-background agreement.[12]

[12]There are at least two focus marking devices that necessarily trigger the use of *jiù*, *zhǐ-yào* 'only-must, if' and *guān̄g* 'alone (postnominal)'. Either marker has unusual properties, and it seems safe to say that segmental focus marking of negated universal quantification over focus alternatives is heavily dispreferred in Mandarin. For some more discussion, see Hole (2004:70f,249–58).

6 Existential quantification over alternatives (∃)

6.1 Delimiting agreement-*yě* and focusing *yě*

Existential quantification over focus alternatives amounts to the *also*-kind of focus quantification, often referred to as 'additive focusing' (König 1991). If I buy also shoes, this presupposes that there is something else which I buy. In a way that Hole (2004) is not fully explicit about, this kind of background marking is a bit problematic in Mandarin. One problem arises from the fact that the typical adverbial focus marker of existential focus quantification and the related agreement marker are homophonous. Both functions are fullfilled by *yě*. It is, therefore, more difficult to see right from the start that a focus marker *yě* and a background marker *yě* should be distinguished. (27) gives two examples, the first one illustrating a clear case of (omissible) focus marking by *yě*, and the second one a clear case of (obligatory) agreement marking by *yě*.

(27) a. FOCUS-MARKING *yě*

Lǎo Wáng (yě) hē-le chá.
old Wang also drink-PRF tea
'Old Wang (also) drank tea.'

b. AGREEMENT-*yě*

*Lǎo Wáng lián chá *(yě) bù hē.*
old Wang even tea YE not drink
'Old Wang doesn't even drink tea.'

A second minor issue arises from the ability of focus-marking *yě* to occur in adverbial position *after* its focus, and this topological property, normally reserved for the set of focus-background agreement particles, adds to the difficulty of keeping the two uses of *yě* apart. However, the ability of focusing *yě* to occur after its focus is entirely parallel to the English use of stressed *also* in PAUL *has* ALSO *arrived*. Just as *also* must be stressed in such sentences with preceding contrastive topics (cf. Krifka 1998), non-agreement *yě* must be stressed under the same circumstances. Agreement particles are never stressed. The interested reader is referred to Hole (2004:42–4) for the more detailed justification of distinguishing a separate non-agreement marking use of *yě*.

6.2 An asymmetry in the system

The third peculiarity to be observed in the domain of existential focus quantification is a slight asymmetry of the relationship of *yě* (∃) and *dōu* (∀) on the one hand, and of *jiù* (¬∀) and *cái* (¬∃) on the other. Turn back to (27b) to see the point. Agreement-*yě*, the agreement marker for existential focus quantification, is used even though the focus itself is explicitly marked for universal focus quantification by *lián* 'even' (see section 4). In itself, this is not a problem, because universal quantification over a non-empty domain entails existential quantification: If all alternatives are true, then some alternative is true. The asymmetry becomes only evident if we compare these facts with the contrasting case of *cái* (¬∃) vs. *jiù* (¬∀). With a preverbal focus explicitly marked as an 'only'-focus, *cái* must be used, but the use of *jiù* is deviant; this is demonstrated in (28).

(28) *Lǎo Wáng zhǐyǒu* [*chá*] *cái/*jiù hē.*
old Wang only tea CAI/JIU drink
'Old Wang drinks only [tea].'

(28) with *jiù* is bad even though 'no contextually relevant alternative proposition is true' entails 'not all contextually relevant alternative propositions are true'. I have nothing conclusive to say about this asymmetry in the system, but one might want to explore the following possibility: perhaps the observed asymmetry stems from the difference between presupposition and entailment in focus semantics. Agreement-*yě* (∃) and agreement-*dōu* (∀) are both triggered by foci that presuppose their respective quantificational types. Agreement-*jiù* (¬∀) likewise presupposes the information about the alternatives, whereas agreement-*cái* (¬∃) is the only particle that is triggered by an entailment.[13] If the particles are sensitive to this difference, then it doesn't take us by surprise that *jiù* cannot replace *cái* in (28). The 'only'-marked entailment focus doesn't go together with an agreement particle reserved for presuppositional focus semantics, viz. *jiù*, even if the quantificational types are in principle compatible.

Except for the fact that agreement-*yě* would make our system of four quantificational types complete, we haven't seen any arguments why agreement-*yě* should be considered the background marker of existential quantification over alternatives, and not just a variant of *dōu*, i.e. of the marker for universal quantification over alternatives. And indeed, conclusive evidence is not at all easy to come by. There does not seem to be a simplex ad-focus marker comparable to *zhǐyǒu* 'only' or *lián* 'even' which necessarily triggers the use of agreement-*yě*. Recall that stressed adverbial *yě* 'also' may be used even if its focus precedes it (cf. the discussion that follows ex. (27)), so the need for an additional focus marker is not obvious. Nonetheless, there is indirect evidence that supports the idea that agreement-*yě* is not just a variant of agreement-*dōu*. Turn to (29) for an interesting contrast.[14]

(29) a. *Jíshǐ* [*guówáng lái*], *wǒ yě/dōu bù qù.*
even.if king come I YE/DOU not go
'Even if [the king comes] I won't go.'

b. *Jiùshì* [*guówáng lái*], *wǒ yě/#dōu bù qù.*
even.if king come I YE/DOU not go
≈ 'Even if [the king comes] I won't go.'

Both sentences look like ordinary concessive conditionals, but while (29a) is fine with either *dōu* or *yě*, (29b) only tolerates *yě*. The only difference between the two sentences is located in the sentence-initial elements, viz. *jíshǐ* as opposed to *jiùshì*. These elements have a subordinating function, and a focus marking function, and therefore they have been glossed as 'even if'. But, as the approximate equal sign in the translation of (29b) indicates, the two cannot be fully identical in function, otherwise *dōu* should be just as fine in (29b) as it is in (29a). If we look at the

[13] It is like chickening out to put this into a footnote, but I have to assume that in our domain, and at the relevant level of analysis, the difference between assertion/entailment and presupposition does not matter.

[14] Another construction which requires the use of agreement-*yě* to the exclusion of agreement-*dōu* is the Mandarin counterpart of *rather…than*-constructions. The 'rather'-marker *nìng(kě)* is invariably followed by agreement-*yě*. I have not been able to exploit this construction in my argumentation because I lack a semantic account of the Mandarin construction.

make-up of the subordinating words, we find that the first syllable of *jiùshì* is written with the same character that is also used to write *jiù*, the background marker of ¬∀-type focus semantics (cf. section 5), viz. 就. There are several other subordinating-and-focus-marking particles with an identical function which contain this syllable, for instance *jiùsuàn*, or *jiùràng*. They all require *yě* as a background marker. Even if we can't say that focus marking *jiù-* is the same as background marking *jiù* at a synchronic level, we should try to exploit our knowledge about *jiù*'s quantificational type to elucidate that of *jiùshì*-type subordinators. The simplest assumption would be that *jiùshì*-words are like markers of concessive conditionality, except that they preclude the possibility that all alternatives are true. Other alternatives are true, *but at least one must be false*. The latter would be the common component of focus marking *jiù-* and of background marking *jiù*. A focus marked for this type (∃ & ¬∀) will not be compatible with background marking *dōu* anymore, because *dōu* requires all relevant alternatives to be true. Whether this reasoning can be used to explain the contrast in (29) hinges on at least two factors. One would have to find more evidence to support the claim that a combined focus semantic type like '∃ & ¬∀' may exist, and one would have to explain why, if the assumption of such a type is warranted, *jiù* is never used as a *background* marker following *jiùshì*-type subordinators. In my corpus, at least, this does not occur. Provided these two obstacles could somehow be cleared, then the contrast in (29) would be good evidence in support of the claim that background marking *yě* is correctly characterized as being of type ∃, and that it is not just a variant of *dōu*, which is of type ∀.[15]

7 Mapping focus-background partitionings to tripartite quantificational structures

Let us assess the results of the preceding paragraphs within the overall plan of the paper. The highly systematic core of the conventionalized module of Mandarin focus-background agreement was reviewed, and we had the opportunity to see that the relevant agreement markers *cái*, *jiù*, *dōu* and *yě* follow the information-structurally distinguished constituents that they co-vary with. Their position is fixed; they occur at the left edge of the larger verbal complex of the main predication. This yields the marked focus-background topology in (30a).[16] (30b) is the canonical focus-background topology found with run-of-the-mill cases of adverbial focus marking not only instantiated by the Mandarin focus markers *zhǐ* 'only' or *shènzhì* 'even', but also by adverbial uses of *only* in English.

(30) a. The non-canonical focus-background topology triggering background-agreement
$$\binom{\text{back-}}{\text{ground}}\ \text{FOCUS}\ \binom{\text{back-}}{\text{ground}} + \textit{cái}/\textit{jiù}/\textit{dōu}/\textit{yě} + \text{background}$$

b. The canonical focus-background topology with adverbial focus markers
$$\text{background} + \textit{zhǐ}/\textit{shènzhì}/\ \ldots + \binom{\text{back-}}{\text{ground}}\ \text{FOCUS}\ \binom{\text{back-}}{\text{ground}}$$

[15]There is more to be said about the peculiarities of agreement-*yě* than we have space for. A further restriction governing the occurrence of *yě* has most likely to do with veridicality (for the recent putting to use of this concept cf. Giannakidou 1997, 1999). Agreement-*yě*, if used in constructions involving indefinite pronouns as discussed in section 4, is only licensed in non-veridical contexts, i.e. in the scope of a sentence-level operator which does not entail that the embedded proposition is true. Such sentence-level operators are, for instance, possibility modals, or negation. For more details see the aforementioned references, or Hole (2004:86–9).

[16]The focus-background topology of (30a) glosses over the special case of C-topics triggering the use of *jiù* as discussed in sections 5.3 and 5.4.

Recall from section 1 that the right-hand backgrounds of (30a) are at least VPs and probably, as Shyu (1995) claims, non-epistemic modal phrases or aspect phrases. As said in section 1 already, this kind of partitioning into focus and background regularly yields focus quantificational structures in which the VP is identified with the background. The opposite is true of the canonical focus-background topology in (30b): The VPs following the adverbial focus markers *zhǐ* 'only', *shènzhì* 'even' etc. must contain the focus relating to the adverbial focus markers.

Quite informally, the quantificational aspect of the system of conventionalized background marking in Mandarin can be summarized as in (31).

(31) a. Presupposition of *dōu*-sentences: All alternative propositions are true.

b. Presupposition of *yě*-sentences: Some alternative proposition is true.

c. Entailment of *cái*-sentences: No alternative proposition is true.

d. Presupposition of *jiù*-sentences: Not all alternative propositions are true.

Let us check now how this general architecture of the system of conventionalized background marking in Mandarin relates to ideas about the representation of the semantics of focus particles that are commonly found in the literature. The result of this survey will be that (i) the type of format chosen here allows for the simplest and most coherent statement of the system; (ii) the mapping to tripartite quantificational structures proposed below captures intuitions about focus quantification more accurately than the mapping that is predominantly used in the literature for 'only'-type foci; (iii) alternative semantics à la Rooth (1985), as opposed to structured meanings, allows for a simpler statement of restrictions of sets of alternatives.[17]

7.1 Focus semantics and tripartite structures: some candidate mappings

It is a common assumption that foci are mapped to nuclear scopes in a tripartite structure format of quantification (cf. Partee 1995:546,592). But it is not at all clear what this means in detail, and I will try to shed some light on this question in the present section. Let us compare some possible candidates for partitionings of the focus-semantic entailment of a sentence with an 'only'-focus.

(32) Only [Bill] came to the party.

(33) a. $\neg\exists x[x \in$ set of alternatives to Bill$][(x$ came to the party) is true$]$

b. $\neg\exists p[p \in [\![(32)]\!]^f_{C7}][p$ is true$]$[18]

(34) a. $\forall x[x \in$ set of alternatives to Bill $\&$ (x came to the party) is true$][x =$ Bill$]$

b. $\forall p[p \in [\![(32)]\!]^f_{C7}$ $\&$ p is true$][p =$ Bill came to the party$]$

[17] This is not to say that I side with "puristic" versions of Rooth's theory which dispense completely with structured propositions (von Stechow 1982) for the modeling of focus semantics. Since the syntactic repercussions of the focus-semantic phenomena discussed here are so obvious I certainly need a way to oppose focus constituents and background constituents in the syntax, and this annuls the economical advantage that the Roothian *in-situ* interpretation of foci has. Once the foci have moved, we may just as well interpret them where we find them instead of lowering them back to their base positions. Still, spelling out contextually restricted sets of alternatives will turn out simpler if we make recourse to alternative propositional wholes as in the Roothian tradition, and not just to alternative focus values. See the following subsections for discussion.

[18] Cf. fn. 11.

(35) a. $\forall x[x \in$ set of alternatives to Bill $\&\ x \neq$ Bill$][(x$ came to the party) is false$]$

b. $\forall p[p \in [\![(32)]\!]^{f}_{C7}\ \&\ p \neq$ Bill came to the party$][p$ is false$]$

The tripartite structures in (33) through (35) are equivalent ways of stating the focus-related entailment of (32).[19] They vary along the three dimensions in (36).

(36) a. Quantification over alternative focus values vs. quantification over alternative propositions (a-versions vs. b-versions)

b. Assertion of truth or falsity in the nuclear scope vs. identity statement in the nuclear scope ((33)/(35) vs. (34))

c. Negated existential quantification vs. universal quantification ((33) vs. (34)/(35))

(33a) amounts to Horn's (1969) analysis of *only*-entailments, except that (33a) makes use of the tripartite structure format of quantification instead of relying on Horn's propositional logic formula. Inasmuch as the focus is opposed to the background and quantification is over alternatives to the focus value only, (33a) is a representation in the structured-propositions tradition for the treatment of focus syntax and semantics (von Stechow 1982). (33b) is a format which makes reference to complete propositions instead of focus values only. In this respect (33b) is in the tradition of Rooth (1985). This format is never chosen in mainstream formal semantics, but it will be the kind of format that I will favor at the end of this discussion. The contrast between quantification over alternatives to the focus value as opposed to quantification over alternative propositions recurs in the other pairs in (34) and (35), but now the universal quantifier is used to express the entailment of *only*. (34a/b) and variants thereof are the kinds of partitionings that are typically found in formal accounts of the meaning of *only* (cf. Rooth 1985; Kratzer 1991b; Büring & Hartmann 2001 among many others). The versions in (35) are like those in (33), except that outer negation plus existential quantification has been replaced by universal quantification and inner negation. (35a) amounts to the (didactic) proposal in Heim & Kratzer (1997:257).

7.2 Sorting out nuclear scopes with identity statements

It is not fully clear to me why typically some version of (34), that is one with a universal quantifier and an identity statement in the nuclear scope, is used to express the 'only'-entailment. I can make two guesses, though. The first one has to do with the fact that in (34a) the focus value occurs in the nuclear scope, and that seems to coincide with the idea mentioned at the beginning of this section, namely that the focus should be mapped to the nuclear scope. My second guess concerns a general inclination towards the "preferred quantifier in formalizations". Whenever possible, formal semanticists will use the universal quantifier, because it has such a fundamental role in formal semantics, especially in comparison with negated existential quantification. What strikes me as flawed in representations like (34a/b), though, is the fact that the 'only'-entailment should intuitively be a statement about the truth or falsity of alternatives (as in (33) or (35)), and not about identity (as in (34)). This intuition is also reflected in the widespread formulation that focusing is about 'evoking and considering alternatives'. With 'only'-words, which combine focus semantics with a truth-conditional import, 'considering alternatives' must be sharpened

[19] They are only equivalent if the respective sets of alternatives are restricted in a specific way. I will turn to this issue in a moment.

to 'evaluating the truth of alternatives'. This is done in the nuclear scopes of (33) or (35), but not in (34). If (34) is sorted out on these grounds, what becomes of the idea that 'foci should be mapped to the nuclear scope'? I think that this wording is insufficiently clear, and even metaphorical. It is unimportant where in the tripartite structure the focus value is mentioned (if it is mentioned at all); what matters is where the assertive import of 'only'-focusing is spelled out. Seen from this perspective, the way the intuitively important component of 'considering the truth of alternatives' is hidden in the restrictor in (34) becomes questionable. As a result of this discussion I will assume that (33) and (35), repeated here as (37) and (38), remain as candidates for a reasonable mapping of 'only'-entailments to tripartite structures.

(37) a. $\neg\exists x[x \in$ set of alternatives to Bill$][(x$ came to the party) is true$]$

b. $\neg\exists p[p \in [\![(32)]\!]^f_{C7}][p$ is true$]$

(38) a. $\forall x[x \in$ set of alternatives to Bill $\& \; x \neq$ Bill$][(x$ came to the party) is false$]$

b. $\forall p[p \in [\![(32)]\!]^f_{C7} \; \& \; p \neq$ Bill came to the party$][p$ is false$]$

I will defer the discussion of the necessary restriction of the set of alternatives for another moment and deal with the contrast between and universal negated existential quantification between (37) and (38) first.

7.3 Sorting out universal quantification

As stated above, the differences between (37) and (38) are inert both in terms of truth-conditions, and in terms of the partitioning into restrictor and nuclear scope. But if we look at the different options in the context of conventionalized background marking in Mandarin, a preference for structures as in (37) emerges. Recall that *dōu* as a background marker is triggered by strong NPIs, 'even'-foci, and some other categories. The quantificational type was identified as universal in section 3 ('all alternatives are true'). If we take this to be natural and uncontroversial, and if we want to keep the differences in our expression format for the relevant focus semantics restricted to the quantifiers (and this appears to be desirable), then the simplest assumption is to oppose the (simplified) quantificational statements in (39), and not the ones in (40).

(39) a. All alternatives are true.

b. No alternative is true.

(40) a. All alternatives are true.

b. All alternatives are false.

Independent evidence to support the idea that universal quantification resides in the *dōu*-corner of the system comes from the polysemy of background marking *dōu*. As mentioned in fn. 7, the primary use of *dōu* is as a distributivity operator. This makes the assumption of a semantics involving universal quantification for the homophonous background marker plausible. Taking together *dōu*'s claim to universal quantification, and the wish to keep changes in the quantificational format restricted to the quantifier, the only candidate for operatorhood in 'only'-assertions is negated existential quantification ($\neg\exists$).

7.4 The preference for quantification over p-sets

The reasoning so far leaves us with the two candidates in (33)/(37), repeated here as (41). (41a) quantifies over alternatives to the focus value, and (41b) over alternative propositions that only differ in the position of the focus value.

(41) a. $\neg\exists x[x \in$ set of alternatives to Bill$][(x$ came to the party) is true$]$
b. $\neg\exists p[p \in [\![(32)]\!]^f_{C7}][p$ is true$]$

The problem with tripartite structures as in (41a) is that they require special machinery to deal with scale reversals. Take the sentences in (42)/(43) and their respective 'only'-entailments as an example. (Both (42b) and (43b) are quantificational structures with quantification over alternatives to the focus value as in (41a).)

(42) a. Little Wang ate only $[\text{three}]_{\text{F}}$ apples.
b. $\neg\exists x[x \in \{1, 2, 3, \ldots\}]$[(Little Wang ate x apples) is true$]$

(43) a. Only if Little Wang ate $[\text{three}]_{\text{F}}$ apples did he have enough.
b. $\neg\exists x[x \in \{1, 2, 3, \ldots\}]$[(if Little Wang ate x apples he had enough) is true$]$

Even though the focus of *only* and the material preceding the focus are identical in both sentences, the exclusion of alternatives goes in different directions, but this is not stated in (42b) and (43b). Stated in terms of alternatives to the focus value, *only* in (42a) excludes values higher than 'three', and lower values are irrelevant; *only* in (43a), on the other hand, excludes values lower than 'three', and higher values are irrelevant. This information is not included in the tripartite structures, because by just quantifying over alternatives to the focus value, this kind of information is not accessible without further amendments. To be sure, the observed reversal of relevant alternative values is a consequence of the monotonicity behavior of numbers in different portions of a proposition. But if *only* just quantifies over the alternatives to the focus value, i.e. if the domain restriction doesn't make reference to the monotonicity facts, then quantification will often be over undesirable alternatives. Such a consequence could be avoided if every focused (or focusable) constituent were annotated for its monotonicity properties (see Dowty 1994 for such an implementation). I think we should aim at a more parsimonious solution, though.[20] If we choose representations that make reference to propositions in the restrictors, the sorting out of irrelevant alternatives can be achieved without any costly amendments. We only need to say that quantification may not be over trivial alternatives. If, by putting our 'only'-semantics to work, we excluded alternatives that are trivially true, then a contradiction would be the result. Look at our examples again, now with quantification over propositions.

(44) a. Little Wang ate only $[\text{three}]_{\text{F}}$ apples.
b. $\neg\exists p[p \in [\![(44a)]\!]^f_{C4}][p$ is true$]$

(45) a. Only if Little Wang ate $[\text{three}]_{\text{F}}$ apples did he have enough.
b. $\neg\exists p[p \in [\![(45a)]\!]^f_{C4}][p$ is true$]$

[20] Cf. Jacobs (1983:224–231) or Löbner (1990) for related discussions.

At first blush, the same problem as in (42)/(43) seems to arise. For instance, the focus meaning or p-set for (44a) as generated by Rooth's mechanism will contain the proposition 'Little Wang ate two apples'. It is a type-identical alternative which differs from the proposition only at the position of the focused constituent. According to (44b) it must be wrong. But since it is entailed by *Little Wang ate three apples*, it cannot be false. What looks like a problem is already the way out. Such alternatives can be sorted out by a general mechanism before quantification applies. All members of the p-set which are entailed by the proposition with the focus value, i.e. with numbers between 'one' and 'three' in (44a), are sorted out right from the beginning. Like this, the p-set will only contain realistic alternatives. From now on I will annotate realistic focus meanings or p-sets with an R-subscript in addition to the context index. We thus get the realistic p-set in (46a) for (44), and the realistic p-set in (47a) for (45). The modified quantificational structures for the 'only'-entailments are provided in the b-lines.

(46) a. $[\![(44a)]\!]^f_{R,C4} = \{$*L.W. ate four apples, L.W. ate five apples, L.W. ate six apples, …*$\}$

b. $\neg\exists p[p \in [\![(44a)]\!]^f_R][p$ is true$]$

(47) a. $[\![(45a)]\!]^f_{R,C4} = \{$*if L.W. ate one apple did he have enough, if L.W. ate two apples did he have enough*$\}$

b. $\neg\exists p[p \in [\![(45a)]\!]^f_{R,C4}][p$ is true$]$

7.5 Realistic p-sets for the other focus semantic types

Reasonings like the one for the realistic p-set restriction of 'only'-foci are necessary for the other types of foci, too. The reasoning for 'also'-type quantification, that is, existential quantification over alternatives, is similar. With 'also'-type quantification over alternative propositions, only propositions that may possibly be presupposed may be in the domain of quantification. Propositions that are entailed by the assertion are not presupposed, and they may not be, so they must be sorted out from the p-set before quantification applies. Put differently, sorting out entailments makes sure that the alternative presupposed as true by 'also'-type focusing is not one that is entailed to be true, anyway, while all other alternatives may happen to be false. This makes sure, for instance, that 'also'-type quantification doesn't have a proposition like 'He ate a kind of vegetable' in its domain when the assertion is 'He ate (also) carrots' (note the deviance of *#He ate a kind of vegetables, and he also ate carrots*). Again, trivial alternatives are excluded from the domain of quantification to arrive at realistic p-sets or focus meanings.

The reasoning for negated universal quantification ($\neg\forall$) is the mirror-image of the reasoning for existential and negated existential quantification, and it has already been developed in the context of custom-tailoring the analysis of *jiù*-foci so that it could be applied to contrastive topics in Mandarin (cf. section 4.5). The point there was that the p-set may not contain propositions which contradict the proposition with the C-topic value (and the focus value). At least one alternative must be false in *jiù*-sentences, but this false alternative may not be one that *must* be false by way of an entailment of the asserted proposition. It must be an alternative that is false independently of the proposition in the assertion. With $\neg\forall$-type focus quantification, the formation of realistic p-sets will, thus, mean that contradictions of the assertion are excluded from the p-set. An analogous reasoning is valid for $\forall$-type focus quantification. The p-set may not contain propositions that contradict the assertion. If it did, it couldn't be the case that all alternatives are true. Table 2 assembles the facts of realistic p-set formation for our domain.

quantifier	excluded from the domain/the realistic p-set are propositions that …	reasoning	the proposition with the focus value ends up …
¬∃	… are entailed by the proposition with the focus value	Including the entailed propositions would result in a contradiction.	… outside the domain/the realistic p-set
∃		Including the entailed propositions would lead to trivial alternatives being criterial while only non-trivial ones ought to be criterial.	
¬∀	… contradict the proposition with the focus/CT value	Including the contradicting propositions would lead to irrelevant alternatives being criterial while only those alternatives ought to be criterial that are in principle compatible with the truth of the assertion.	… inside the domain/the realistic p-set
∀		Including contradicting propositions would result in a contradiction.	

Table 2: Formation of realistic p-sets for different quantificational types

The restrictions on the quantifier domains/the p-sets that are summarized in Table 2 constitute a kind of amendment to the restrictions that affect p-sets as a consequence of contextual information. A pure p-set is just the set containing all type-identical alternatives that only differ from the original proposition in the position of the focus. This set is restricted by contextual information, which is typically modeled by way of a (silent) context anaphor in the syntax (cf. von Fintel 1994). The kind of restriction dealt with here cannot be of this contextual kind because it varies with the kind of semantic focus type. It must either be written into the semantics of the focus particles, or, and this seems more plausible, it follows from general assumptions about the informativity and non-contradictoriness of utterances. Only if we assume the above restrictions on realistic p-sets will utterances with focus particles be informative and non-contradictory. A side effect of this general mechanism is highlighted in the fourth column of Table 2. The proposition with the focus value is part of the realistic p-set only with ¬∀-type focusing (*jiù*) and ∀-type focusing (*dōu*). This gets us the problem out of the way that is obvious with non-manipulated p-sets. If a p-set of a sentence with an 'only'-word has as one of its members the proposition with the focus value, then this proposition will lead to a contradiction with ¬∃-type focusing. The realistic p-sets assumed here pose no such problem.

The complete set of tripartite structures for our four focus-semantic types is given in (48).

(48) *cái*-sentences: $\neg\exists p[p \in \text{p-set}_{\text{R, C}i}][p \text{ is true}]$
jiù-sentences: $\neg\forall p[p \in \text{p-set}_{\text{R, C}i}][p \text{ is true}]$
dōu-sentences: $\forall p[p \in \text{p-set}_{\text{R, C}i}][p \text{ is true}]$
yě-sentences: $\exists p[p \in \text{p-set}_{\text{R, C}i}][p \text{ is true}]$

Inasmuch as the p-sets are functions of backgrounds, our model makes sure that backgrounds are mapped to the restrictor. Inasmuch as focusing can be reduced to considering the truth of alternative propositions, the nuclear scopes correspond to the focussing function.

If we abstract away from the individual operators in (48), we arrive at a generalized format as in (49).

(49) $\lambda Qp[p \in \text{p-set}_{\text{R, C}_i}][p \text{ is true}]$

(49) is a one-place predicate which takes a quantifier as its argument and delivers a truth value. This way of representing focus quantification sheds an interesting light on the perennial controversy whether focus 'presuppositions' are existential presuppositions. The debate centers around the question whether a proposition with a focus presupposes that the background predicate is true of something. Geurts & van der Sandt (2004) have recently defended this claim again, and Büring (2004) or Schwarzschild (2004) have, just as recently, rejected it once more. Against the background of our discussion we might tentatively assume that focus-background structures do not, by themselves, carry the existential presupposition. Structures of the type in (49) could then be subjected to existential closure at the discourse level if no other quantifier has saturated the predicate before that.[21]

This concludes the description and analysis of the plain Mandarin system of focus-background agreement. Before we enter into the discussion of its interaction with modality, the main results so far may be summarized as follows:

(i) There is a single quantificational format to cover the four focus-semantic types of Mandarin that trigger focus-background agreement and that were reviewed in sections 3–6;

(ii) Quantifying over realistically restricted alternative propositions/focus meanings/p-sets is implemented more easily than quantifying over sets of alternatives to focus values;

(iii) The VP material that follows the background markers *cái*, *jiù*, *dōu* and *yě* (co-)defines the p-set;

(iv) Since the p-set plays its role in restricting focus quantification, and since p-sets are (co-)defined by VP material in the constructions at hand, VPs are consistently mapped to restrictors in sentences with *cái*, *jiù*, *dōu* and *yě*;

(v) (iv) is in direct contrast with Diesing's (1992) Mapping Hypothesis, according to which VP material is mapped to the nuclear scope;

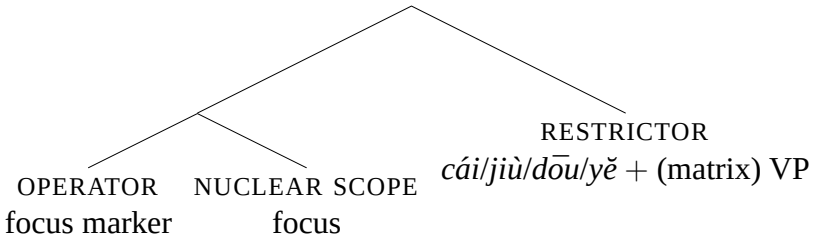
(vi) Nuclear scopes of sentences with focus particles assess the truth of realistic alternative propositions.

[21] This idea is, of course, inspired by Heim's (1982) existential closure rule which is argued by her to be active in the interpretation of indefinites.

8 Non-canonical structures II: Main clause modal *ad-hoc* restrictors

In a somewhat simplified way, the focus-background structures of the preceding sections may be depicted hierarchically as in (50).

(50) Syntactic mapping of focus-background agreement structures in Mandarin



The parenthesized reference to *matrix* VPs in (50) is supposed to remind us of the fact that focus-background agreement also occurs in complex sentences. (51) (=(13a)) is such a complex sentence.

(51) *Zhǐyǒu* [*Lǎo Wáng lái*], *wǒ cái qù.*
only.if old Wang come I CAI go
'Only if [Old Wang comes] will I go.'

The focus of (51) is (in) the subordinate clause, the focus marker is likewise in the subordinate clause, and the focus-background agreement marker is a constituent of the matrix clause, which contains (the largest portion of) the restrictor material. Provided one has a compositional solution for the semantics of '*only-if*'-clauses, (51) does not pose any further problems (for the requisite discussion of conditionality and 'only-if'-clauses (in Mandarin) see, among many others, von Fintel 1994, 1997 or Hole 2004:129–38 and the references cited there).

8.1 The problem

The more interesting case, and the one in which modality enters the scene, is exemplified in (52). It, too, was discussed in section 1 in a preliminary fashion. (See the appendix for some more attested examples of this construction.)

(52) [*Lǎo Wáng bìxū qù dàshǐguǎn*], *cái néng shēnqǐng qiānzhèng.*
old Wang must go.to embassy CAI can apply.for visa
'Only if [Old Wang goes to the embassy] can he apply for a visa.'/'[Old Wang must go to the embassy] to be able to apply for a visa.'

The descriptive problem with (52) was as follows: if we translate the sentence as an 'only-if'-conditional, the modal of necessity in the first clause is in the way ('Only if he (#must) go(es) to the embassy can he apply for a visa'); if we treat the first clause as superordinate (this is done in the second translation of (52)), we're ignoring the syntactic structure, which undoubtedly embeds the first clause within the second. Regarding the matter of subordination I put the suspicious reader off till the present section (cf. section 1). (53), finally, presents a sentence that provides strong evidence that the first clause in structures like (52) is syntactically subordinate.

(53) *Tā bìxū* [*xià yǔ*] *cái lái ma?* (Eifring 1995:223)
(s)he must fall rain CAI come Q
'Does (s)he come only if [it rains]?'/'Does it have to [rain] for her/him to come?'

The two translations of this sentence again reflect the two possibilities of relative subordination in English depending on whether an *only-if*-construction (without a modal) is chosen, or a purposive construction. The crucial feature of (53) is its sentence-final question marker *ma*. It marks the whole utterance as a yes/no-question. The question marker *ma* takes widest scope, and it always forms a constituent with the highest proposition in the syntactic structure. If this is so, we can be sure that *cái*-sentences as in (52) and (53) with the problematic modals have basically the same syntactic structure as the usual 'only-if'-sentences exemplified by (51). The highest proposition in (53) must thus be the whole utterance minus *ma*, with the additional embedded proposition *bìxū xià yǔ* 'must fall rain'. Since I know of no syntactic phenomenon that would show *ma* and *bìxū xià yǔ* to be an underlying constituent, I will take it for granted that the main clause analysis for the predicates following *cái* holds in general.

There is a second piece of evidence to corroborate the assumption of a subordinate status of the clause with the modal. Sometimes such clauses contain uncontroversial subordinators, and this kind of example is not at all hard to find. (54) is such an example (adapted from rp:26).

(54) *Yào děng* [*nǐ jiāo-le jièshàofèi*] *yǐhòu, wǒ cái kěyǐ gěi nǐ ānpái.*
necessary PRT you pay-ASP commission after I CAI can for you arrange
'We have to wait until [you have paid the commission] before I can arrange things for you.'/'Only after [you have paid the commission] can I arrange things for you.'

The indicators of subordination in this complex sentence are *děng…yǐhòu* 'after'. There's a slight complication in that *děng*, in its basic use, is a verb with the meaning 'wait'. But if it co-occurs with the clause-final subordinator *yǐhòu* 'after' (and not only then), it is commonly analyzed as partaking in the temporal subordination signaled by *yǐhòu* 'after' (cf. Eifring 1995:180,375). Unless one assumes a polysemy for *yǐhòu* 'after', with one variant occurring in subordinate clauses, and the other one occurring in main clauses as a main clause complementizer, examples such as (54) force us to acknowledge the embedded status of the first clause in such sentences.

(55) summarizes the dilemma once more (NEC stands for the necessity operator).

(55) a. sentential make-up: [[NEC p] *cái* q]
b. translation into English: [NEC [p[*in order for* q *to come about*]]]
or: *only* ~~NEC~~ *if* p, *then* q

8.2 Two preliminary attempts at a solution

In Hole (2004:251–253) I discuss three possible methods of getting a handle on the apparent mismatch of syntax and semantics in (52) through (54), but I dismiss them in favor of a fourth solution. Here's a short review of those two analytical options among the three disfavored options that appear most realistic.

(i) Implicit anaphora
One might assume that the structure that is interpreted is not as in (55a), but as in (56). The phonetically empty material that would have to be postulated is enclosed in curly brackets.

(56) NEC p {and [(*only*) *if* PRON_p} *cái* q]

In (56), the modalized proposition is not subordinate any longer. Instead, it is conjoined with a conditional construction such that the interpretation of the proposition under the necessity operator determines the interpretation of the propositional pronominal in the protasis of the conditional construction. A sentence like (52) may then be rendered as 'Old Wang must go to the embassy, and (only) if he goes to the embassy can he/he can apply for a visa'. An analysis along such lines receives some support from a pattern found in English and other languages.

(57) You have to practice, only then can you win.

In (57), *then* is anaphorically related to *you practice*, and not to *you have to practice*. So it appears in principle possible for a propositional pronominal to have its reference anaphorically determined by a proposition which is embedded under a modal in the preceding clause.

I think that such an analysis, if worked out in detail, would be the only serious competitor to the analysis to be proposed below. An obvious obstacle that would have to be cleared is the fact that the supposedly implicit material in the Chinese construction could not easily be analyzed as a single constituent. Instead, a sequence of a conjoining element, an '(only-)if'-clause marker, and the pronominal PRON_p would each have to be phonetically empty for their own reasons (the '(only-)if'-clause of (56) would form a constituent with '*cái* q' in (56), and not with the conjunction). As I said, such an analysis may be feasible, but I want to try and convince the reader that something else fits more neatly into the larger picture.

(ii) Recategorization: NEC > COMP

The second possibility that we will consider for a moment would be to say that the modal of necessity has been recategorized as a complementizer. This idea, too, has some initial appeal to it, because this is precisely how the uncontroversial complementizer *yàoshi* 'if' has emerged. *Yào* is a modal verb (its synchronic meaning is 'must, want', and *shi*/*shì* is a copula. There are two strong arguments against the idea that the modals of necessity in our construction are really complementizers. The first one is pretheoretical, but very strong for native speakers. *Bìxū* 'must' and *yào* 'necessary, must' as in (52), (53) or (54) are felt to be modal verbs, and not conjunctions. There is no doubt about this. A more theoretical argument is based on improbability. If we were to distinguish modal verbs from homophonous complementizers, we would be confronted with a highly unlikely coincidence. All the necessity modals used nowadays would have given rise to homophonous complementizers at a point in the past when the set of modal verbs and their functions were still different from the ones we find today. In view of the great time depth that the general pattern under scrutiny here has, this would be extremely implausible (cf. Eifring 1995:254–57). What appears more plausible is to say that the pattern of subordination represented schematically in (55) has been a constant pattern for more than a millennium, and whatever were the current modals necessity at a given point in time could be used in this pattern.

8.3 The solution favored here: Main clauses as modal *ad-hoc* restrictors

Recall the simple English example and its tripartite structure representation from section 1 above, which are repeated here as (58).

(58) a. Old Wang must go to the embassy.

b. $\forall w[w$ is a world maximally similar to the ideal worlds in terms of the ordering source at hand, say, worlds in which things only happen the way required by the regulations for the issuing of visas$]_{\text{RESTRICTOR}}$[Old Wang goes to the embassy in $w]_{\text{NUCLEAR SCOPE}}$

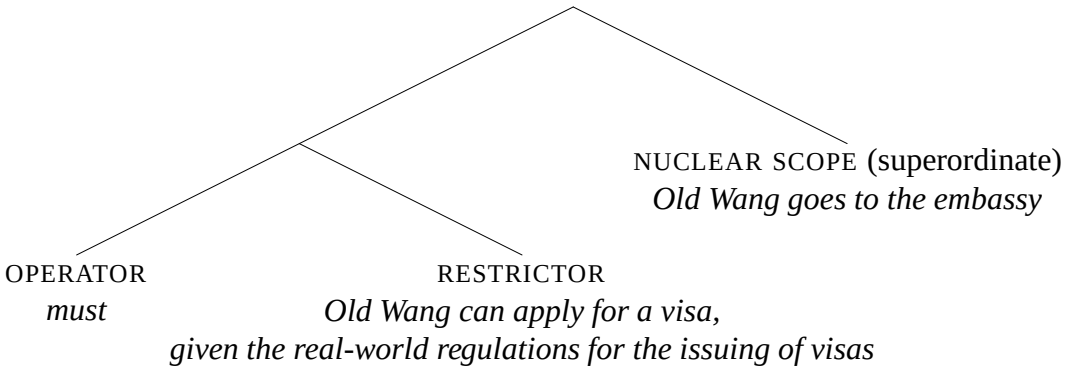
The tripartite structure in (58b) contains a universal quantifier which ranges over possible worlds. This universal quantifier may be identified with the modal verb *must* in (58a). The remainder of the overt material of (58a) is mapped to the nuclear scope of (58b). The nuclear scope may be identified with the set of possible worlds in which Old Wang goes to the embassy. All the overt material of (58a) has thus been mapped to some component of the tripartite structure. But universal quantification is modeled as a relationship of (set) inclusion – recall from above that *Every boy eats chocolate* may be modeled as the inclusion of the set of boys in the set of people who eat chocolate. We will therefore have to say that the context has to furnish us with a subset of the worlds which define the nuclear scope, and such a set of worlds is characterized in the restrictor of (58b). Accounts in the spirit of Kratzer (1981, 1991a) will grant constituent status to this restrictor material, i.e. Kratzer's ordering source.[22] And indeed, contextually relevant material can be made explicit in *if*-clauses, in purpose clauses and with other means. (59) gives two such options for suitably contextualized specific examples. (S-subscripts mark the nuclear scope, the R-subscript marks the restrictor.)[23]

(59) a. If [Old Wang wants to be able to apply for a visa, and given the regulations for the issuing of visas]$_{\text{R}}$, [he]$_{\text{S}}$ must [go to the embassy]$_{\text{S}}$.

b. [Old Wang]$_{\text{S}}$ must [go to the embassy]$_{\text{S}}$ to [be able to apply for a visa, given the regulations for the issuing of visas]$_{\text{R}}$.

Compositional analyses of such examples typically make use of an LF structure with the overall constituency in (60) (cf., for instance, von Fintel & Iatridou 2004; linearization is irrelevant in (60).) The complication of having *wants* in (59a) in addition to *to* as opposed to plain purposive *to* in (59b) is likewise ignored.)

(60)



A (heavily simplified) lexical entry for *must* to yield the desired interpretation is given in (61).

[22] I'm disregarding the second component of the restrictor material in Kratzer's system, viz. the modal base which sets apart epistemic modalization from circumstantial/non-epistemic modalization. All the data discussed in this paper involves circumstantial modal bases.

[23] Information-structure is ignored in the present section, but I will plug it in again in section 8.4.

(61) $[\![\textit{must}]\!] = \lambda$R$\lambda$S.R $\subseteq$ S

R in (61) is the variable ranging over sets of restrictor worlds, and S is the variable ranging over sets of nuclear scope worlds. If we plug in the sets of worlds defined by the restrictor material and the nuclear scope material in (60), respectively, we arrive at the truth condition in (62). (From now on I sometimes abbreviate the ordering source formerly referred to as 'given the real-world regulations for the issuing of visas' as 'gvr' for 'given the visa regulations'.)

(62) {w: Old Wang can apply for a visa, gvr, in w} $\subseteq$ {w': Old Wang goes to the embassy in w'}

The simple idea for the problematic Mandarin data, which are again exemplified in (63) by our old example, is to say, (i), that modals in these sentences take their arguments in the reverse order if compared with standard modalized sentences and, (ii), that the node dominating the modal and the nuclear scope is syntactically subordinate, whereas the restrictor is syntactically superordinate.

(63) [*Lǎo Wáng bìxū qù dàshǐguǎn*], *cái néng shēnqǐng qiānzhèng.*
old Wang must go.to embassy CAI can apply.for visa
'Only if [Old Wang goes to the embassy] can he apply for a visa.'/'[Old Wang must go to the embassy] to be able to apply for a visa.'

(64) $[\![\textit{bìxū}_{rev}, \textit{yào}_{rev}, \textit{děi}_{rev}, \ldots]\!] = \lambda$S$\lambda$R.R $\subseteq$ S

(64) provides us with a lexical entry for such "reverse" modals of necessity. The differences between the individual modals in (64) don't matter at this level of generality, as long as the modals are necessity modals. Point (i) from above (reverse order of the arguments) does not seem to pose any insurmountable problems given that tripartite structures, just by themselves, don't have a binary constituency (cf. below and Partee 1995). Still, a word about conservativity may be in order. If we require all natural language quantifiers (and not just all determiners) to be conservative, there may be a problem with the lexical entry in (64). Conservativity is defined for run-of-the-mill determiners like *all* as in (65a).

(65) a. A determiner D is conservative iff $D(A)(B) \leftrightarrow D(A)(A \cap B)$, with A and B the sets corresponding to the first and the second argument of the determiner, respectively.

b. *All boys eat chocolate.* $\leftrightarrow$ *All boys are boys that eat chocolate.*

And indeed, the sentences in (65b) are equivalent (if the context for both sentences is kept constant). If we apply the definition of conservativity in (65) in a suitably generalized form to our example in (63) such that it also covers modal quantifiers, and if we adopt the lexical entry for *bìxū* 'must' in (64), we don't get an equivalence.

(66) *bìxū*$_{rev}$({w': O.W. goes to the emb. in w'})({w: O.W. can apply f. a v., gvr, in w})
$\leftrightarrow^{?}$
bìxū({w': O.W. goes to the emb. in w'})({w': O.W. goes to the emb. in w'} $\cap$ {w: O.W. can apply f. a v., gvr, in w})

If the equivalence of (66) were to hold, the following paraphrase of (66) would have to be true: 'All the worlds in which Old Wang goes to the embassy are worlds in which he goes to the embassy and can apply for a visa'. This is false, because if Old Wang goes to the embassy, but doesn't bring his passport along, he won't be able to apply for a visa. I think there's a simple remedy to this problem. Note that the definition of conservativity in (65) makes recourse to the order of functional application (*A* before *B*), and this is reflected in the parlance of 'the first argument of a quantifier' and 'the second argument of a quantifier'. What this parlance tacitly implies is that the first argument represents the restrictor, and the second one the nuclear scope, because that's the way all the ordinary D-quantifiers work. A revised definition of conservativity for quantifiers in general which would not make recourse to this unclear terminology might then look as in (67).

(67) A quantifier Q is conservative if $Q(R)(S) \leftrightarrow Q(R)(R \cap S)$
or if $Q(S)(R) \leftrightarrow Q(R \cap S)(R)$;
else Q is non-conservative.

Thus, even if we extend the conservativity requirement from determiners to quantifiers in general, the proposed lexical entry in (64) is a plausible candidate, and the reversal of the arguments does not lead to any problems as long as we understand the order of argument taking as epiphenomenal.

The second ingredient of the proposal made above for the special Chinese modals under scrutiny here has been to say that the operator and the nuclear scope are syntactically *subordinate*, while the restrictor is syntactically *superordinate*. The first thing to remember in this context is that precisely the same situation holds for the structures of plain, i.e. non-modal, focus-background agreement discussed above (cf. (50)). The problem was just not so obvious, because I didn't provide lexical entries for focus quantifiers that specify the order of argument taking. Moreover, the possibility of finding structures like this has been discussed in the literature, and it turns out that we seem to have found something in the data that has already been postulated on theoretical grounds, and as a consequence of linguistic imaginativeness of a high degree. Here is a first relevant tentative statement made by Partee which concerns the possibility of finding tripartite structures of our exotic kind.

> '[. . .] it seems that [. . .] no language has overtly subordinate structures in which it is the nuclear scope that is expressed by a subordinate clause, while the restrictor is expressed as the main clause.' (Partee 1995:571)

This statement seems to deny the existence of structures as I propose them here, but Partee makes this statement only with respect to structures in which *the operator is always implicit*. This is not the case in our sentences, because the modal is explicit in the structure. The more interesting passage is from the concluding section. I chose a relatively long quote to preserve the special groping style of Partee's impressive paper.

> 'My intuition is that one family of structures is basically operator-headed and its variants can be appropriately grouped together under the original tripartite structure [i.e. one where the operator is in some sense "closer" to the restrictor than to the nuclear scope; D.H.]; binary branching variants would be those representable without changing the order of the three parts [i.e. operator, restrictor, nuclear scope; D.H.].

> (Order then represents potential subgroupability.) I tend to think there is another family of structures [. . .], but I am less clear about how to describe it. What I would like to see is a way to articulate distinct notions of "pragmatically prior" and "semantically prior" so as to be able to say that the restrictor (at least in some structures) is contextually superordinate and "prior" to both the operator and the nuclear scope even if it is itself also semantically bound by the operator and "background" and/or syntactically subordinated.' (Partee 1995:593)

Let us disregard the fact that the proposed Chinese main clause restrictors *follow* the rest of the quantificational structures and are, therefore, not "prior" in every conceivable sense. In every other respect our sentences in (52) through (54) are, under the analysis presented for them here, perfect instantiations of what Partee had in mind. The restrictor is "prior" because it delivers the matrix structure in which the operator and the nuclear scope are embedded. In the above quote, Partee makes a provision to defend her intuition of subordination against what she thinks is more realistic syntactically ('[. . .] the restrictor [. . .] is contextually superordinate [. . .] even if it is itself [. . .] syntactically subordinated'). This proviso is unnecessary in our context. The restrictor is not just "contextually prior" or "superordinate", but also in a plain syntactic sense. The restrictor is, moreover, also "prior" in a second sense. It must, as a whole, be (part of) the background of the focus inside the subordinate nuclear scope clause. This concerns the information-structural side of our construction, and we will turn to its specific interplay with modality in the following section.

8.4 The interplay of modality and information-structure

What I would like to show in this section is that the truth-conditional contribution of the modal structure that we discussed above is identical to the truth-conditional contribution of the focus quantificational structure that goes along with the modal structure. This may sound too prolific to pass the test of parsimoniousness, but I claim that the special construction with main clause modal restrictors is really characterized by this redundancy.

In order not to get lost in the argumentation, let us start by reconstructing the modal reasoning from above in diagrammatical terms.

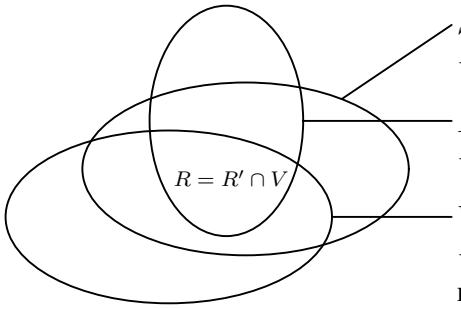
Figure 1 is a representation of the sets of possible worlds that are relevant for the truth-conditions of our paradigm example, repeated here as (68a), with its truth-conditions in (68b/c). (68b) is the more explicit format from (62), (68c) is a tripartite structure saying precisely the same thing. Recall that *gvr* stands for 'given the visa regulations' or 'given the real-world regulations for the issuing of visas'.

(68) a. [*Lǎo Wáng bìxū qù dàshǐguǎn*], *cái néng shēnqǐng qiānzhèng.*
old Wang must go.to embassy CAI can apply.for visa
'Only if [Old Wang goes to the embassy] can he apply for a visa.'/'[Old Wang must go to the embassy] to be able to apply for a visa.'

b. {w: O.W. can apply for a visa, gvr, in w} ⊆ {w': O.W. goes to the embassy in w'}

c. ∀w [O.W. can apply for a visa, gvr, in w][O.W. goes to the embassy in w]

The intersection of R' and V ($R' \cap V$) in Figure 1 yields the restrictor set R corresponding to the sets of worlds on the left sides of (68b/c). If we redraw the diagram just with the immediately relevant sets R and S, we arrive at the simple set inclusion of Figure 2.

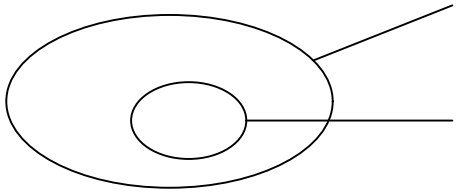


S
$\{w$: O.W. goes to the embassy in $w\}$

R'
$\{w$: O.W. can apply for a visa in $w\}$

V
$\{w$: everything is as or almost as required by the real-world regulations for the issuing of visas in $w\}$
(the set corresponding to the *gvr* ordering source)

Figure 1: Sets of possible worlds relevant to the interpretation of (68a)



S
$\{w$: O.W. goes to the embassy in $w\}$

R
$\{w$: O.W. can apply for a visa, gvr, in $w\}$

Figure 2: Sets of possible worlds relevant to the interpretation of (68a) (reduced version)

This is precisely what we need: a simple set inclusion as required by the truth-conditions of necessity.

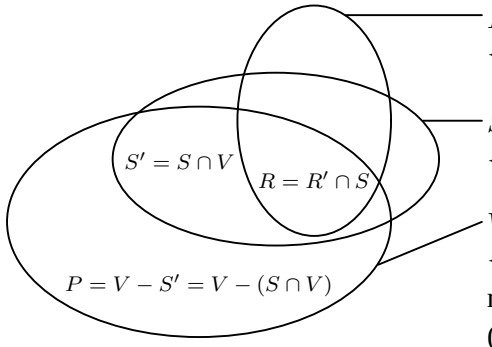
Let us now turn to the information-structural side of the sentence. The sentence is once more repeated in (69a), and its focus-semantic entailment is provided in (69b).

(69) a. [*Lǎo Wáng bìxū qù dàshǐguǎn*], *cái néng shēnqǐng qiānzhèng.*
old Wang must go.to embassy CAI can apply.for visa
'Only if [Old Wang goes to the embassy] can he apply for a visa.'/'[Old Wang must go to the embassy] to be able to apply for a visa.'

b. $\neg\exists p[p \in [\![(69a)]\!]^f_{R,C8}][p$ is true$]$

To arrive at the realistic p-set or focus meaning of (69a) in (69b), we must determine that portion of (69a) that may vary from one proposition to the other in the p-set. Put differently, we must determine the largest possible focus of (69a). I have bracketed the largest focusable constituents in the examples throughout the paper. Remember that material following the background marker *cái* may not be in focus. With the specific construction at hand, the largest possible focus is discontinuous at the surface. Given discourse conditions that don't involve a corrective focus or a repair intonation, the necessity modal may not bear a focus accent, and it may not be in focus. The whole nuclear scope proposition in its scope may, however, be focused, including *Lǎo Wáng* 'Old Wang'. Assuming again that realistic p-sets of 'only'-foci exclude the proposition with the focus value (cf. sections 7.4/7.5), all members of the realistic p-set must be compatible with 'It is not the case that Old Wang must go to the embassy to be able to apply for a visa, given the real-world regulations for the issuing of visas' with the presupposition 'Something must be done for Old Wang to be able to apply for a visa', and such alternatives are excluded by (69b). On an intensional view, a proposition defines a set of possible worlds (viz. the set of those worlds in which it is true), so (69b) quantifies over sets of possible worlds. If we form the generalized union

of the sets of possible worlds excluded by (69b), we arrive at a set that was already represented in Figure 1 above, which we didn't however identify as a set deserving special attention, viz. V-($S \cap V$), the complement of V relative to the intersection of S and V. This set has only those worlds as members in which the visa requirements of the real world are enforced, but no worlds in which Old Wang goes to the embassy. Figure 3 reproduces Figure 1 and newly introduces the sets S' and P.



R'
$\{w$: O.W. can apply for a visa in $w\}$

S
$\{w$: O.W. goes to the embassy in $w\}$

V
$\{w$: everything is as or almost as required by the real-world regulations for the issuing of visas in $w\}$
(the set corresponding to the *gvr* ordering source)

Figure 3: Sets of possible worlds relevant to the interpretation of (68a)/(69a), including information-structure

The realistic p-set of our sentence contains only propositions that are incompatible with the truth of the nuclear scope proposition, that is, worlds in which it is not the case that Old Wang goes to the embassy (cf. the delimitation of realistic p-sets for *cái*-foci in sections 7.4 and 7.5). The rest of the complex proposition remains the same for all members of the realistic p-set. This realistic p-set amounts to set P in Figure 3, viz. to the complement of S' relative to V. The worlds in P are asserted by (69b) to be worlds in which it is impossible that Old Wang can apply for a visa, given the real-world regulations for the issuing of visas. The worlds in which an application is possible were identified above as the worlds in R. And, indeed, as may easily be seen from Figure 3, P and R have no members in common. This is precisely what (39b) requires. At the same time, this is an equivalent way of expressing the modal semantics of (69a). If R must be a subset of S (that amounts to the necessity component of the sentence; cf. Figure 2), then R cannot have any members in the relevant complement of S, viz. in P (that amounts to the 'only'-entailment). Both ways of determining truth-conditions lead to the same result, and this constitutes the perfect fit of modality and information-structure in the construction under scrutiny here.

The reasoning just given is not fully compositional in that it has not provided us with denotations for all nodes in the syntactic representation of our sample sentence. It is basically compositional, though, in that the denotations of major constitutents have been clarified. I will summarize these denotations in (71) for the sample sentence in (70). If compared with (69a), (70) has been changed slightly so as to correspond more straightforwardly to an LF representation, as I assume it here. (Traces are not represented. As before, *gvr* stands for 'given the visa regulations of the actual world'). As justified a moment ago, (71f) and (71g) are just different ways of stating equivalent truth-conditions.

(70) [[$_{\text{NEC+S}}$[$_{\text{NEC}}$ *bìxū*][$_{\text{S}}$ *Lǎo Wáng qù dàshǐguǎn*]], [$_{\text{R}cái}$ *cái* [$_{\text{R}}$[*gvr*] [*Lǎo Wáng*
must old Wang go.to embassy CAI old Wang
néng shēnqǐng qiānzhèng]]]].
can apply.for visa

'Only if [Old Wang goes to the embassy] can he apply for a visa.'/'[Old Wang must go to the embassy] to be able to apply for a visa.'

(71) a. $[\![R]\!] = \{w$: the real-world regulations for the issuing of visas are observed in w and Old Wang can apply for a visa in $w\}$

b. $[\![R_{cái}]\!] = [\![R]\!]$ (R figures in an 'only'-type quantificational structure, but no constituent of R may be (part of) the focus)

c. $[\![NEC]\!] = \lambda \mathrm{S} \lambda \mathrm{R}_{cái}.\mathrm{R}_{cái} \subseteq \mathrm{S}$

d. $[\![S]\!] = \{w$: Old Wang goes to the embassy in $w\}$

e. $[\![NEC + S]\!] = \lambda \mathrm{R}_{cái}.\mathrm{R}_{cái} \subseteq \{w$: Old Wang goes to the embassy in $w\}$

f. $[\![(70)]\!] = \{w$: the real-world regulations for the issuing of visas are observed in w and Old Wang can apply for a visa in $w\} \subseteq \{w$: Old Wang goes to the embassy in $w\}$

g. 'only'-entailment of (70): $\neg\exists p[p \in [\![(70)]\!]^f_R][p \text{ is true}] = \{w\colon w \in \bigcup [\![(70)]\!]^f_R\} \cap \{w\colon w \in p_{\mathrm{ASS}}\} = \varnothing$

I am optimistic that the analysis which has been spelled out for a single sentence here is general enough to be applied to all *cái*-sentences which, at first, seem to have a necessity modal in the wrong, viz. subordinate, position. As said above, more attested examples in addition to the ones in (52)–(54) have been collected in the appendix, and the reader is invited to apply the above reasonings to them.

The most important ingredient of the analysis is the reverse argument structure of the modal in this construction. This way, the restrictor of the modal ends up in the syntactically superordinate position. The second peculiar property of the construction with the main clause modal restrictors is the custom-tailored interplay of modality and focus semantics. What is in the restrictor of the modal may not be in focus. To be sure, foci within the nuclear scopes of modal structures may also be prototypical in other modal constructions for the simple reason that the restrictors of modal tripartite structures are often implicit. But our construction enforces this mapping, and that makes it peculiar. What is more, it forces the coincidence of focused material and modal nuclear scope material *at the cost of a non-prototypical syntax*. A prototypical syntax would accommodate the focus and the nuclear scope in the matrix VP, but precisely this is excluded in the construction with main clause modal restrictors.

8.5 Main clauses as *ad-hoc* restrictors with other particles

All the examples in the preceding section were *cái*-sentences. Analogous examples also occur with *jiù*, and with *zài*. *Jiù* is the background agreement marker of negated universal focus quantification discussed at length in section 5. *Zài* is a peripheral member of the paradigm of background markers which I haven't discussed in this paper. If the analysis in Hole (2004:240–245) is correct, its realistic p-set is restricted to a cardinality of 1, and this single alternative is false. The restriction of the cardinality of the p-set, plus the exclusion of an alternative, makes *zài* look like a variant of *cái* ($\neg\exists$) in some examples, and of *jiù* ($\neg\forall$) in others.

(72) and (73) present one example with *jiù* and with *zài*, respectively. The discussion of these sentences is preliminary and serves mainly to mention possible points of departure for future research.

(72) [*Lǎo Wáng zhǐ-yào qù dàshǐguǎn*] *tā jiù néng shēnqǐng qiānzhèng.*
old Wang only-must go embassy he JIU can apply.for visa
'Old Wang only has to go to the embassy to be able to apply for a visa.'/'If Old Wang goes to the embassy, he can apply for a visa.'

(73) [*Wǒmen zhǐhǎo xiān huíqù ná-le qián*], *zài lái*
we have.no.choice.but.to first return take-ASP money ZAI come
bàomíng. (rp:51)
sign.up
'It seems we'll have to return home first and get the money before we can come back and sign up.'/'We'll only come back and sign up after we have returned home to get the money.'

The analysis of these sentences is complicated by the fact that we always find a focus marker in addition to, or as part of, the modal operator in the subordinate clause. *Zhǐyào* in (72) illustrates the relatively perspicuous case of a function word made up of two components that we have repeatedly referred to in the present paper, namely *zhǐ* '(adverbial) only' and *yào* 'must, be necessary'. The perspicuity of this form is in contrast with its usual treatment in didactic grammars and some linguistic accounts because *zhǐyào* is commonly categorized as a complementizer meaning 'if', which obligatorily triggers the use of *jiù* in the main clause. Given what we know about the parallel cases in *cái*-sentences, this is certainly a superficial analysis. In the context of this paper I will, however, not be able to come up with a competing analysis that is as explicit as the one for analogous *cái*-sentences. The recalcitrant fact is that it is not obvious how the overall type of focus quantification in (72) ($\neg\forall$) can be matched with the 'only'-word plus the necessity modal in the subordinate clause. In terms of paraphrases, the answer seems simple. If, for (72) to be true, Old Wang only has to go to the embassy to be able to apply for a visa, then some other action may also yield the same result (say, sending all the required materials by mail), but not all alternative actions will do (say, making a phone call to the embassy). What is not clear to me is how the prefixing of *zhǐ-* 'only' before the modal of necessity annuls the special requirement found with the necessity modals of sections 8.2 through 8.4, viz. that *nothing else* will do.[24]

Similar things can be said about (73), except that this sentence features an additional complication, viz. the function word *zhǐhǎo*. On the one hand, *zhǐhǎo* is normally left unanalyzed and is rendered as 'must, have no choice but to' in dictionaries. On the other hand, *zhǐhǎo* contains *zhǐ* 'only' again, and *hǎo* alone has a (somewhat underdetermined) modal use as 'can, should, it is best to'. The most common use of the character used to write *hǎo* is as a word meaning 'good', and the modal use is clearly related to this use as an adjective or stative verb. I have no synchronic analysis of *zhǐhǎo*, and in the absence of one I will refrain from making any further speculations. Suffice it to say that, just as in (72), the interplay of focus semantics and modality triggers our peculiar construction again in which matrix VPs are mapped to restrictors of modal tripartite structures, and to backgrounds of focus-quantificational structures at the same time.

[24]This problem will probably not boil down to another version of the converseness problem associated with the relationship between *if*-conditionals and *only-if*-conditionals. For the discussion of this problem see, again, von Fintel (1994, 1997) or Hole (2004:129–38).

9 Non-canonical structures III: Conventionalized main clause modal restrictors

A construction especially designed to express *ad-hoc* modal restrictors, as discussed in the preceding larger section, may be a good thing to have, but something better is yet to come. I claim Mandarin has a construction expressing *conventionalized* modal restrictors or ordering sources irrespective of modal force.[25] This is the last empirical sub-domain that we will review in this paper, and it will hopefully serve to plausibilize further the idea that main clause predicates in Mandarin are a conventionalized position for restrictors in non-canonical quantificational structures.

(74) is an instance of a sentence with a conventionalized modal ordering source marker in the root-VP.

(74) [*Wǒ* *xīwàng* *méi* *yǒu* *shì*] *cái* *hǎo!*
I hope not exist trouble CAI OPTATIVE
'I really hope there will be no trouble!'

The translation and the gloss given in (74) presuppose a certain analysis of the sentence. *Hǎo*, a stative verb or adjective with the basic meaning '(be) good', is glossed as an optative marker here. If we were to translate (74) in one of the ways we translated the sentences in the preceding section, we would get 'Only if there is no trouble is it good'. Apart from the fact that this translation would miss the point of the word *hǎo* in the example, it still serves to show that sentence (74) instantiates a sub-type of our previous sentences in that "the modal is in the way".

Our introductory example (74) may be good to justify the general subsumption of the construction treated here under the more general type of sentences with main clause modal restrictors. It is not very good, though, to demonstrate that *hǎo* has the function of an optative or bouletic ordering source marker, because *xīwàng* 'hope', by way of its lexical content, already includes information concerning the ordering source. A better example to make the point concerning the marking of the ordering source would be (75), in which the modal is implicit.

(75) [*Nǐ* *zhīdao*] *jiù* *hǎo* *le!*
you know JIU good PRT
'I'm glad [you know it]!'/'I wish [you knew it]!'/'I wish [you'd known it]!'

(75) is multiply ambiguous in that neither the temporal relations nor the realis or irrealis status of the embedded proposition is signaled. Nevertheless, all faithful translations of this sentence into English make reference to the speaker's hopes or desires by the use of an adequate modalizing expression (*glad* or *wish* in (75); adverbs like *fortunately* or *hopefully* would also be appropriate given matching contexts in terms of factuality). Put differently, the set of restrictor worlds is defined so as to include only worlds in which the things that the speaker desires are true. If we compare this construction with the main clause *ad-hoc* restrictors of the previous section, the following difference emerges. Part of the restrictors of the modal constructions in the previous sections were implicit. In the example dealing with Old Wang's visa application, the regulations for the issuing of visas were implicit. The set of the ideal worlds defined by this implicit ordering source (V), was then intersected with the set of worlds as defined by the main clause proposition

[25] I know of no other treatment of this construction in the literature. Alleton (1972:138,151) identifies the relevant cases as deserving special attention, but no attempt is made at an analysis.

(R'; worlds in which Old Wang can apply for a visa). The resulting overall restrictor, R, then corresponded to that set of worlds in which the visa regulations of the real world were observed and in which Old Wang could apply for a visa. The construction discussed here expresses the conventional ordering source in that syntactic position in which the *ad-hoc* restrictor component occurred in the other construction.

The special status of this construction with conventionalized markers of the ordering source is evinced by the following facts (see Hole 2004:260–1 for exemplification):

(i) nothing may intervene between the agreement particle and the following predicate; in other complex *cái*/*jiù*-sentences, negation markers, adverbial material and some other things may occur in this position;

(ii) nothing may intervene between the right edge of the subordinate clause (*zhīdao* in (75), *shì* in (74)) and the agreement particle; typically this is a possible subject position (cf., for instance, (72));

(iii) the predicate following *cái* or *jiù* in the construction is never used in its literal, or most basic sense.[26]

The maximum structure for sentences with "sentential endings" expressing the modal ordering source is given in (76) (PRT stands for the sentence-final particles that are frequently used in Mandarin; they don't matter here).

(76)
$$\text{clause} + \left\{\begin{matrix} cái \\ jiù \end{matrix}\right\} + \left\{\begin{matrix} hǎo \\ duì \\ xíng \\ kěyǐ \\ shì \end{matrix}\right\} + \text{PRT}$$

The interplay of the properties which define the construction, especially (i) and (ii), leads to the effect that the sequence of *cái*/*jiù*, the ordering source marker and the possible sentence-final particle may be recategorized as a single complex sentence-final particle. I cannot make any well-grounded statement as to how much the 'clause'-part of (76) has lost its embedded status already, but it seems clear that it will lose it over time.[27]

We have only seen uses of *hǎo* as a conventionalized ordering source marker so far, and there's a reason for this. While the classification of *hǎo* as marking optative or bouletic ordering sources is beyond doubt, the ordering sources corresponding to most other markers are still somewhat unclear to me. The only other marker whose function is fairly clear is *duì* (literally: 'right'). It denotes ordering sources of a moral kind; that is, it ranks worlds as to how close they come to an ideal in terms of the quality or appropriateness of interpersonal and social behavior. The examples in (77) may suffice to illustrate this use.

[26]This latter property may not serve to define the construction in a strict sense, because it is not independent of the analysis that I propose for it.

[27]Cf. Bisang's (1992) idea of an 'attractor position' for the emergence of modal markers at the right periphery of Chinese sentences. The sentence-final focus-sensitive expression *éryǐ* 'only, that's all' is an example of a function word which has gone through precisely this conventionalization channel. It combines an old conjunctional element (*ér*) with an old verb *yǐ* 'to end'.

(77) a. [*Nǐmen yīnggāi jiào wǒ 'āyí'*] *cái duì!* *(rp:2)*
you should call I aunt CAI MORAL
'[You should really call me 'Auntie']!'/'Be good kids and [call me 'Auntie']!'

b. [*Wǒmen yīnggāi xièxie nǐ*] *cái duì!*
we should thank you CAI MORAL
'It is a matter of proper behavior that we thank you!'/'We are really morally obliged to thank you!'

c. [*Nǐ juān qián*] *jiù duì le!*
you donate money JIU MORAL PRT
'The fact/possibility of your donating money is fine (from a moral perspective)!'/'You can donate the money, and you'll have done a good deed.'

In Hole (2004:263) I propose an implementational ordering source for *xíng* '(lit.:) be okay/work out fine' and *kěyǐ* '(lit.:) be possible/allowed', and it seems that this ordering source always relates to the requirements of certain schemas of conventional actions, such as buying and selling, or negotiating some provision of a service. The last ordering source marker in (76), *shì* '(lit.:) be right', is the one I know least about, and I will refrain from speculating about its possibly purposive ordering source here.

The reader may be convinced at this point that we are really dealing with conventionalized markers of ordering sources independent of the modal force (note that (77c) must be argued to contain an implicit possibility modal, while other sentences above have universal modal force). What is not so clear is, once more, the exact matching of modality types on the one hand, and *cái*-marking vs. *jiù*-marking on the other. Another area that requires further clarification is the realis/irrealis distinction in the construction with conventionalized modal restrictors. It may turn out that *cái*-sentences are always restricted to non-factual readings, that is, the proposition in the nuclear scope of the modal did not hold in the past and does not hold at the moment of utterance. This restriction does not seem to be active in *jiù*-sentences (cf. (75) or (77c)). But even with these uncertainties in mind, the potential of this construction to underpin the main claim of this paper is not challenged; Mandarin makes regular use of a non-canonical way of mapping syntactic structure and quantificational structures such that the restrictor ends up syntactically superordinate, and the nuclear scope subordinate. Moreover, the parallelism between the information-structural mappings and the modality mappings manifests itself perspicuously in this domain as well. The largest possible foci in sentences with conventionalized markers of the modal ordering source coincide with the nuclear scopes of the modal structures.

10 Conclusions

This paper has concentrated on a non-canonical, though perfectly regular, group of Mandarin sentence types which is characterized by the consistent mapping of VPs to the nuclear scopes of tripartite structures. All the relevant sentences are sentences in which the relevant tripartite structures are focus-background structures. Parasitic on this, non-canonical modal quantification may be expressed.

We have seen a fully unfolded system of focus-quantificational types. 'Fully unfolded' is meant to capture the fact that all four quantificational types of classical logic ($\forall$, $\exists$, $\neg\forall$, $\neg\exists$) are conventionalized. The assumption of a conventionalization of the $\neg\forall$-type of focus quantification

is probably a matter of controversy, but I have tried to show how this quantificational type fits into the system.

To get the system of four quantificational types to work, we made use of the auxiliary concept of 'realistic p-sets'. Realistic p-sets are an innovation which allows one to state a restriction on sets of alternatives which is not delivered by the context, and probably not by the focus-sensitive particles, either. Instead, realistic p-sets emerge because of general requirements that hold for common grounds. Common grounds may not be contradictory, and no trivial information should be added to them. These requirements allow us to sort out different, though easily definable alternatives from p-sets, depending on the type of focus quantification relevant for the sentence at hand.

The idea of a single format of focus quantification went hand in hand with the assumption that differences between focus quantificational types should be stated locally. This locality requirement was implemented by allowing tripartite focus quantificational structures to differ in the position of the quantifier only. If we abstract away from the individual focus quantifiers in these tripartite structures, we arrive at a general focus semantic format. A restrictor and a nuclear scope are headed by an unspecified quantifier which quantifies over propositions/sets of possible worlds. This may be implemented as a tripartite structure which has an open argument slot in the position of the quantifier. In the absence of a focus quantifier provided by material in a sentence, this argument slot may be saturated by (existential) discourse focus closure.

Further innovations propagated in the sections on non-canonical sentences with modals were modal operators which take their arguments in reverse order if compared with standard modals. The backgrounded VP material in these sentences is not just mapped to the nuclear scopes of the focus quantificational structures; it also ends up in the restrictors of the modal tripartite structures.

If one takes Kratzer's (1981; 1991a) theory of modality seriously, the discovery of conventionalized modal ordering source markers irrespective of modal force should not be much of a surprise – which, in fact, it was for me and probably is for many researchers. But if Kratzer has identified the onomasiological components of modality correctly, then each component ought to be subject to analytical expression in some language. Seen from this angle, the conventionalized ordering source markers identified in this study provide a piece of empirical support for Kratzer's modeling of the realm of modality and, in particular, for her division of modal restrictor material into modal base (epistemic vs. circumstantial) and ordering source.

Considering the degree of syntactic entrenchment of the phenomena which I have discussed, one may wonder 'where semantics meets pragmatics' in this contribution, (cf. the title of the workshop on which the present volume is based), or whether semantics meets pragmatics at all. We have seen very rigid syntactic patterns in the constructions under scrutiny, structures that were concomitant with the semantic patterns of information-structure. No pragmatics here. Moreover, I have followed the tradition which semanticizes and syntacticizes contextual information by assuming context anaphora as constituents. No pragmatics there, either. Shouldn't this paper rather be included in a collection entitled 'Where semantics eats pragmatics', then? I think not. Admittedly, I have concentrated on phenomena that belong to core grammar, but if we zoom out a bit, a true semantics-pragmatics issue defines our whole investigation. Recall from the first section and from remarks made throughout the paper that there are not just non-canonical mappings of VPs to restrictors in Mandarin, but also, and probably predominantly, canonical mappings of VPs to nuclear scopes. Examples of such canonical cases are repeated in (78) and (79).

(78) *Lǎo Wáng zhǐ hē chá.*
old Wang only drink tea
'Old Wang only drinks tea.'

(79) *Lǎo Wáng bìxū qù dàshǐguǎn.*
old Wang must go.to embassy
'Old Wang must go to the embassy.'

In (78), the VP does include the focus, and in (79), the VP is mapped to the nuclear scope, while the restrictor is implicit. Therefore, Mandarin presents speakers with a choice between canonical and non-canonical matchings of syntax and quantification. What makes them choose either option? I have no answer to this question, just tentative ideas. First and foremost, sentences with non-canonical mappings tend to be more "emphatic" than the sentences in (78) and (79). How this is to be modeled, if it is empirically correct, will again be controversial. Semanticists may define sentence-level operators à la Krifka (1995) which implement the semantic counterparts of emphasis (exhaustivity, scalarity, etc.). Pragmaticists may prefer to leave the choice between the canonical and the non-canonical mappings to softer factors. Whichever road one takes, the pragmatics will have to make available the right kinds of objects from which semantics may take what it needs. Perhaps I should try and convince the editors that the volume should be renamed 'Where pragmatics feeds semantics'.

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Appendix

(i) *Tā bìxū xiān juédìng zìjǐ-de xíngdòng, cái néng yùcè biànhuà-de*
(s)he must first decide self-of actions CAI can predict change-of
hoùguǒ.
outcome
'He must first be clear about his own actions before he can predict the outcome of the changes.'/'Only if he is clear about his own actions first can he predict the outcome of the changes.' (adapted from Eifring 1995:239)

(ii) *Tā bìxū guīguījǔjǔ, cái néng duìdeqǐ jiānglái-de lǎopó.*
(s)he must be.very.well-behaved CAI can be.worthy.of future-of wife
'He must behave extremely well to be able to live up to the standards of his future wife.'/'Only if he behaves extremely well will he be able to live up to the standards of his future wife.' (Eifring 1995:225)

(iii) *Qián cè shang yào jīngdǎxìsuàn, cái yǒu hǎo rìzi guò.*
money strategy on must act.with.extreme.caution CAI have good days spend
'One has to act with extreme caution in money affairs if one wants to live comfortably.'/'Only if one acts with extreme caution in money affairs can one live comfortably.' (rp:44)

(iv) *Tàitài yīdìng yào zhǎngwò xiānshēng-de hébāo, xiānshēng cái bù huì luànlái.*
wife definitely must control husband-of purse husband CAI not will get.out.of.control
'A wife must be in control of her husband's money in order for the husband not to get out of control.'/'Only if a wife is in control of her husband's money will the husband not get out of control.' (rp:26)

CONTRASTIVE TOPIC/FOCUS AND POLARITY IN DISCOURSE

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Abstract[*]

The information structure categories of Contrastive Topic and Contrastive Focus are examined to see their crucial roles in polarity and (conventional) implicature generation and implicature suspension and their respective correlations with PA and SN conjunctions on one hand and descriptive (denotational) negation and metalinguistic negation on the other. The underlying notion of concessivity involved in both Contrastive Topic and Concessive and thereby derived scalarity are exemplified. Their role in quantifiers and quantifier positions on the Square of Opposition is also investigated. So far the role of information structure has not been duly entertained in the semantics and/or pragmatics of implicature and polarity or rather in the "border war" (Horn 2005) between the two. Korean, English and some crosslinguistic data are employed to seek general principles.

1 Introduction

This paper explores how Contrastive Topic (CT) basically evokes polarity-reversed conventional but scalar implicatures in information structure and how it involves scalarity via concessivity and thus is related to negativity (and negative polarity) in an interesting way. CT, *-nun*-marked in Korean or with contrastive intonation L+H*LH% in English, is different from its non-CT correspondent, case-marked in Korean or with no contrastive intonation in English; CT always generates implicatures, while the non-CT-marked correspondent generates conversational scalar implicatures in certain contexts but not always. The controversy over global vs. local computation of implicatures may depend on how we view the general tendency of general inferences of generalized conversational implicatures associated with linguistic expressions becoming stereotyped and conventionalized in the linguistic system; conventional forms are tempted to be treated in the semantic, grammatical system, although we cannot ignore discourse-related, pragmatic aspects of the inferences and defeasibility involved. CT marking will be a good testing device. It also investigates how CT is distinct from Contrastive Focus (CF); we can see that CF is involved

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in metalinguistic negation, whereas CT is deeply involved in default implicatures of a descriptive or denotational nature.

Topicality not only involves the aboutness of a referent for comment in topic-comment partition in a sentence but it also involves linking with some potential topical elements mentioned or assumed in the previous discourse (cf. Hetland 2003). Therefore, a topical constituent is not limited to a nominal category but ranges to a verbal and any kind of category. CF, on the other hand, is basically focal, although an alternative question involving a limited given set of alternatives is assumed to precede the utterance with CF in the previous discourse. Therefore, the analysis of CT and CF is naturally modelled to be based on a dialogue or discourse model of question and answer. This paper basically argues that CT responds to a conjunct or one scalar value of a previous/accommodated (conjunctive) question with a potential Topic (Lee 1999a), whereas CF follows or accommodates an alternative disjunctive question (Lee 2003b). This explains why CF is intuitively exhaustive and why CT conveys a denied stronger/higher predicate meaning. This distinction will help remove much confusion about the categories CT and CF in the field of information structure (e.g. contra Han 1998; Choi 1999 and others) and help understand how far semantics (of scalar entailments) works and from what point pragmatics (implicatures) intervenes. Recently much has been done on the phenomenon of CT, though with diversity or some confusion in terminology, in German (Buring 1997), in Korean (Lee 1999a) and in English (Steedman 2000). Steedman (to appear) adopts 'Contrastive Theme.' But the nature of CF has not been well explored and the two categories have not been clearly characterized in a question and answer dialogue model, although Carlson (1983) and Roberts (1996) make use of the model with respect to CT. Kamp's (2004) 'focus' is Contrastive Focus, with its explicit alternatives and a *which* question preceding. The category of *kontrast* set by Vallduví & Vilkuna (1998) include all sorts of focus-related phenomena including *wh*-words and CT, though in contrast with rheme. It may be quite general but is not conceptually revealing. This paper will use Korean and English data for arguments, but will utilize some other languages whenever necessary.

The notion of Topic has been fairly well characterized by Kuroda (1972); Kuno (1973); Lee (1973); Gundel (1974); Reinhart (1981) and others with various factors such as prominent position, definiteness (or specificity/partitivity), aboutness, and judgement types of categorical vs. thetic (Ladusaw 2000). But still many Western linguists including Roberts (1996) are skeptical about the theoretical status of noncontrastive Topic and even those including Buring (2003) who work on CT exclude Topic from information structure categories. Buring's "s-topic," though basically changed to 'contrastive topic' recently after Lee (1999a) (Buring 2003), is more discourse-related than his discourse- or d-topic, which is a non-contrastive Topic. AI people's use of 'focus' or 'in focus' is applied to Topic and Gundel's (1999) recent somewhat misleading use of 'psychological focus' for Topic or 'in focus' for referent accessibility hierarchy (Gundel et al. 1993) seems to have been influenced by AI. The label of 'focus' has become fashionable. We cannot agree with Steedman's (2000) claim that a *wh*-word in a question is a 'theme.' Thus viewed, Topic may be a futile topic and Focus may be just a hocus pocus, although much progress in information structure is noticed. If we turn to CT and CF, the phenomena themselves are more complex and we can see more confusion: CT is often called CF by many syntacticians. We will try to see a clear distinction between the two in the flow of information in discourse along with the correspondence between meaning and prosody, particularly structurally different meanings associated with different prosodic features of the topic marker *-nun* in Korean. We can see that contextual clues on alternatives involved in CT interpretation have a psychological reality. We can also see how the conjunction distinction between PA and SN is strongly correlated with CT

and CF, respectively. We will see how CT is strongly associated with polarity-reversal for denial in its unuttered part and how it interacts with overt negation, touching on its further interaction with the Concessive (CNC) focus particles *-to* 'even' for polarity and *-man* 'only' for another dimesion of scalarity.

2 Contrastive (predicate) topic and conventional scalar implicatures

2.1 Topic condition and contrastive topic

A non-contrastive Topic, with the widest possible scope in meaning in a sentence, is based on (assumed) common ground and the rest of a sentence is typically "about" it (Reinhart 1981) and thus cannot have any focal H^* tone involved cross-linguistically. It is typically generic, inherently conditional and intensional (Lee 1996), as follows:

(1) *inswayki-nun* *hankukin-i* *palmyenghae-ss-ta.*
printer-TOP Korean-NOM invent-PAST-DEC
'The printer, a Korean invented it.'

A referential Topic is an instance of Topic in a special, closed-circuit world, typically mentioned in the previous discourse. The following is an example, when asked, "Where did Sue go?"

(2) *ku ai-nun* *hakkyo-ey* *ka-ss-e.*
the child-TOP school-to go-PAST-DEC
'The child went to school.'

Because this noncontrastive Topic is directly linked to and is coreferential with its antecedent Sue across the sentence, the Topic phrase can be easily deleted in Korean, although at least a pronominal is needed in English. In (1), 'the printer' may not be deleted because it may be introduced for the first time and must be evoked from common ground world knowledge.

A coherence relation between the Topic phrase and its complement is required as follows (Lee 2003a):

(3) **Coherence** condition for topical S: The Topic phrase in Spec, TopP must be coherently related to the complement of the Topic. This dependency relation based on the Topic marker requires coherent anaphoric (binding), conditional (based on causal/logical), possessive (alienable/inalienable), whole-part, set-member relationship, necessarily with the LARGER (in its abstract denotational sense, including scope) in the TopP preceding the smaller in the complement phrase (Lee 1989, 1994).

Extra-sentential (or 'dangling') Topics occur at times, based on coherence of causal or conditional relations between them and the rest of the utterances (e.g., *Coffee-nun cam-i an w-a* 'Coffee-Top sleep doesn't come' (see Lee 2003a).

A Topic, non-focal, also involved in the head formation of relativization, and licensed largely by the assertive mood in the matrix sentence, cannot occur within relative and subordinate clauses, as in (4).

(4) *Mary-nun* [*Yumi-ka/*-nun* *o-ki* *cen-ey*] *ttena-ss-ta.*
Mary-TOP Yumi-NOM/TOP come-NMZ before-at leave-PAST-DEC
'Mary left before Yumi came.' [NMZ = Nominalizer]

However, Contrastive Topic can occur in relative and subordinate clauses even in German, contra Jacobs (1997) and Krifka (1999), but in line with Molnar (1998). In English, a subject but not an object in the relative clause can become a CT because of thematic hierarchy and prosody (Lee 2003a). In contrast, Korean is far more flexible in allowing CT in the relative clause and subordination largely because it is morphologically marked. Typically it is definite, but even an indefinite NP can become a Topic, if it is modified by some familiarizing expression so that it can be anchored in the speech situation and accommodated by the hearer.

After a Topic nominal with *-nun* (or a null Topic), another *-nun*-marked nominal constituent becomes a CT if it is in the complement IP, with the relation smaller than the Topic in denotation. When we talk about elephants and about their noses in contrast with other head parts, assuming the hearer's query about the potential Topic of elephants' head parts, a CT of 'nose' is taken from a contextually given set of relevant and comparable contrastive alternatives such as {nose, ear, horn} in head (and neck) body parts. If the 'nose' nominal is not CT-marked, it is typically NOM-marked with no contrastive meaning/implicature. Paradigmatic choice in the whole linguistic system is much broader and is a different story. Consider:

(5) *khokkiri-nun* *kho*-nun *kil-ta.*
elephant-TOP nose-CT long-DEC
'As for the elephant, its nose$_{\text{CT}}$ is long.'
(G$n x$ [elephant$'(x)$][x's nose is long] $+>$ x's non-nose alternatives are not long)
[$+>$: implicates]

In spoken Korean, a high tone on the CT marker *-nun* is required for naturalness. In the initial position, *-nun* typically marks a noncontrastive Topic but can be ambiguous between Topic and CT if there is no intonation marked as in a written text. Consequently multi-CT in a sentence is possible, though hard to compute and not most natural. All different kinds of categories can be a CT: Not only those nominals in the above relation but object and dative nominals, PPs, various adverbials, and verbs/adjectives and propositions constitute CT, if marked by *-nun*.

2.2 Contrastive (predicate) topic, list CTs and kinds of scales

Now let us consider Contrastive Topic further. First, why is it called 'Contrastive Topic' rather than 'Contrastive Focus,' or 'TF' (Kadmon 2000)? Why is it claimed to be topical or thematic here? Consider:

(6) Q: What about Frank? Did he eat the beans and (did he eat) the peanuts?
A: He ate the **beans**$_{L+H^*LH\%}$.
A′: *khong-UN*$_{LH^*(\%)}$/?**-ul* *mek-ess-e.*
beans-CT/?*ACC eat-PAST-DEC
'(He) ate the beans$_{\text{CT}}$.' $+>$ 'But he didn't eat the peanuts.'

Contrastive Topics have perceptually and physically distinct pitch accents in various languages such as English (as in 'the **beans**$_{L+H^*LH\%}$ (6A)) and Korean (as in 'khong-UN$_{LH^*(\%)}$' (6A′).

Ward and Hirschberg's (1985) uncertainty intonation L*+H*LH% is distinct from CT intonation. German shows a fall-rise hat accent. Somehow my consultants of French could hardly identify this distinct pitch in French, probably because it already has a sequence of rising pitches with phrasal boundaries, but recently Marandin et al. (2002) reported "C accent" in French, which is functionally equivalent to the B accent of CT, with a rising pitch accent on the first syllable, not the last syllable, of the CT constituent. I could also discern a CT accent in Spanish. This distinct pitch pattern drew linguists' attention to the phenomenon of CT in English (Bolinger 1961 and Jackendoff 1972) but not to non-contrastive Topic. Hetland (2003) noted striking similarities between English and Korean from Lee's (1999a) findings in CT and Hedberg (2002) reanalyzed her prosody and CT/Focus in spoken English on the basis of such findings and demonstrated a parallellism between the two genetically, typologically and areally unrelated languages.[1]

First, there is a sharp difference between the Topic and CT markers in pitch and energy concentration. In (5), a dramatic difference in F_0 pitch height between the first Topic *-nun* and the second CT *-nun* is noticed. The CT *-nun* phrase may be described as LH*(%). There occurs a direct rise from L on the final syllable of the nominal or other lexical constituent (or nominalizer) to the CT marker *-nun*, a non-lexical function element, unlike in Indo-European languages (Lee 1999b). This means that contrastive CT accent and contour in Korean and English is different from other focus accents. The marker *-nun* shows phrasal boundaries, those of Intonational Phrase (IntP=IP) or Accentual Phrase (AP).[2] Because of the phrase-final rise, CT has nothing to do with dephrasing effect witnessed in (Contrative) Focus elements, involving a high pitch on a pre-phrase-final element (cf. Jun 1993). CT *-nun* is also the longest in duration among different phrase final elements in the same position in a sentence.

An L+H* pitch accent followed by LH% is used to "convey that the accented item – and not some alternative related item – should be mutually believed," according to Pierrehumbert & Hirschberg (1990). They hint at topicality by 'mutual belief' in terms of the 'contrast' contour. The CT-marked element is linked to the previous potential Topic and that is why it belongs to the category of Topic rather than Focus in a broad definition. Denotationally, CT typically involves (unexpressed) relevant, comparable alternatives in our mind of the constituent members of the potential Topic (accommodated at times) in the previous context, and the choice from alternatives involves focality unlike in Topic but it is secondary.

Jackendoff's (1972) association of fall-rise 'B-accent' with 'topic' and of falling 'A-accent' with 'focus' is reasonable, although he does not have CT yet. A H* pitch accent is crosslinguistically required for Focus, typically followed by LL% and dephrasing or deaccenting.

List Topic *-nun*, one kind of CT, is far lower (as to be an L) than the typical CT *-nun* in pitch and can be prolonged with mid-H unlike CT *-nun*. It occurs when CT *-nun* sentences are conjoined and no unuttered part remains (Lee 1999b). It is complete with the closure of the potential Topic and simply shows a declension effect. Because it is complete, it does not generate any implicature. Normally, it does not involve concessivity and therefore not scalarity, either. List CTs are conjoined by a noncontrastive coordinate connective (*-ko* 'and') rather than by a concessive one *-ciman* 'but' in Korean and other languages. Observe:

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[1]In Korean, I presented pitchworks experimental studies on various occasions (at the 1999 Tokyo ICSC, 1999 OSU East Asian Psycholinguistics Conference, 1999 Illinois LSA Linguistic Institute, and Hong Kong Int'l Conference on Topic and Focus in Chinese) and they well supported my previous perceptual descriptions.

[2]Mira Oh, in her recent experiments (in preparation – p.c.), observes that the Chennam dialect shows an IntP Boundary in contrast with the Seoul dialect.

(7) *khun ai-nun sa haknyen-i-ko cakun ai-nun i haknyen-i-eyo.*
big child-CT 4 grade-be-and little child-CT 2 grade-be-Dec
'The elder is in 4^{th} grade and the little one is in 2^{nd} grade.'
[To a question: 'What grades are your kids in?']

We can freely have unranked alternative instances of a type on a Hirschberg scale as an answer. Consider:

(8) A: Do you have any juice?
B: I have orange and grapefruit.
+> But I don't have apple/pear/peach/etc. juice.

In most cases, B may think her answer would be sufficient because A uses a weak NPI in a weak nonveridical, though not monotone-decreasing, question context, that has a covert Concessive (*even*) in *any* with a begging or 'settle-for-less' effect (in Korean, ***amu*** *juice*-***i-ra-to*** a weak NPI). Then, the given implicature may not occur except in a particular context. If it occurs, it must be a conversational implicature. But, if B knows that A is picky about juice then the conventional fall-rise contrastive intonation can be used to convey the given implicature and she assumes that A may not be happy with the kinds (quality, not quantity) of juice that B has. This situation is not unlike the closure of the potential Topic in the discourse, if we combine B's utterance with the '+> But -' part. This also belongs to a POSET relation. Another such relation holds between (9A) and (9B). Via accommodation for an indirect but relevant answer, a scale can be set up: <orange juice, {beer, orange juice}>, with the two forming a supertype, i.e., a set of **drinks**, as a pool (sum) of choice. B's subject and object can be CT-marked in Korean. Consider:

(9) A: Did everyone order beer?
B: Somebody ordered orange juice. (Sevi 2005)

In (10), the question has a supertype 'Beatles' autographs' as a potential Topic and the answer is in CT. The CT can have either the autographic prestige ranking reading, as given, or the no ranking partition reading, of which the implicature must be 'but not others' autographs.' In either case, a POSET relation holds and a scale can be set up. Without CT marking, an easily cancellable conversational implicature is possible. With CT marking, a hardly cancellable coventional implicature replaces it. Consider:

(10) A: Do you have Beatles' autographs? (adapted from van Rooy 2004)
B: George Harrison's$_{CT}$.
+> ¬John Lennon's (though ◇Ringo Star's)
a. Autographic prestige ranking:
< Star < Harrison <{Lennon, McCartny}>
b. No ranking "Standard" partition: 4 Beatles -> 16 cells.

Thus viewed, there are scales of different types: (Horn's) entailment, ranking without entailment, and unranking (list).

CT can occur on all phrases (argument and adjunct) of all different categories including adverbs in situ and in fronted positions with the *-nun* marker and high pitch. Observe:

(11) a. *Sue-ka* *muncey-rul* *wuahakey-**nun**/*-man* *phul-ess-ta.*[3]
Sue-NOM work-ACC elegantly-CT/*-only solve-PAST-DEC
'Sue solved the problem elegantly$_{CT}$ (but not quickly).'

b. *He solved the problem (at 2:00) **only** elegantly (and not both elegantly and quickly.) (Szabolcsi & Zwarts 1992)

The CT marker is a functional category in Korean and Japanese. CT marking by intonation alone is possible in other languages. Turning to a CT of an adverb, for the other party's question about how to get to a certain place, (12) is negative and an affirmative proposition with a weaker value than 'well' in the scale is implicated, such as 'but I know just a little bit about it.' It cannot implicate 'I know nothing about it.' The speaker in this situation is willing to cooperate. Observe:

(12) *cal-**un*** *moll-a.*
well-CT not.know-DEC
'(I) don't know (it=how to get there) *well*$_{CT}$.'

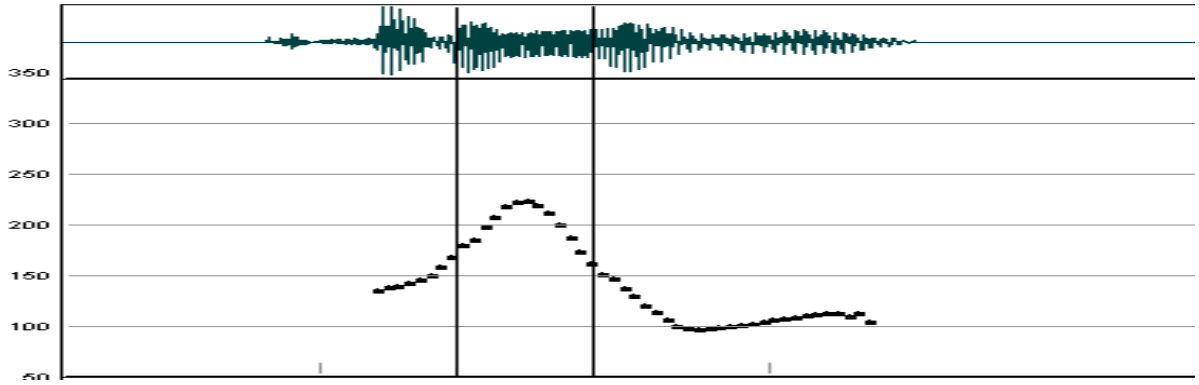

Figure 1: Adverb CT with High Pitch

The surface form *molla* in (12) is complex in meaning and the underlying structure of (12) must be as (13a):

(13) a. *cal al-ci-**nun*** *mot-hay.*
well know-CI-CT not-do.DEC
'(I) don't know (it) well$_{CT}$.' +> '(I) know (it) just a little bit.'

b. ??*cal-**un*** *al-a.* [cf1 *cal al-ki-**nun** hay.*]; [Chae (1977:cf.2)]
well-CT know-DEC
'(I) know (it) well$_{CT}$.' +> '(I) don't know (it) very well.'

[3]In a strong challenge to the other speaker's negative comment, *-man* can be used in the meaning of 'with no other alternative way than *elegantly*; '*yes, elegantly* certainly/surely, why not?' (this kind of uses for *-man* has been discussed in the literature, though this **unique** manner issue has not been addressed).

c. ?**maywu cal-**__un__ *al-a.* cf. *maywu cal al-ki-*__nun__ *hay.*
very well-CT know-DEC
'(I) know (it) very well$_{CT}$.' ?+> '(I) don't know (it) extraordinarily well.'

In (13a) the CT marker is associated with the focal constituent *cal* 'well,' as will be explained shortly, and the verb and negation become one word. Still negation has wide scope over the CT, triggering a weaker positive adverb implicature (from a negative scale <∼very well, ∼well, ∼commonly, ∼a little>). In (13b), *-nun* is readily associated with the adverb *cal* 'well' and may implicate '(I) don't know (it) very well.' But it may rather be associated with the entire predicate first, as in *cal al-ki-*__nun__ *hay* (*cal al* 'know well' as a whole in CT), to implicate, say (*cal*) *selmyeng-ul mot hay* 'cannot explain it (well).' In (13c), because the degree modification is almost quantificationally maximal or universal, it is not easy to find a higher modifier to deny, although a higher predicate alternative may be found to be denied, such as 'but she cannot apply it to practice.' The parallel holds in English.

2.3 Chierchia (2004) vs. Horn (2005) on negative scales: CT required

This is sharply distinguished from an utterance without CT-marking on the relevant constituent:

(14) *cal molla.*
well don't.know
'I don't know it well.'

Utterance (14), as opposed to (13), can be used when the speaker knows (almost) nothing about it. The speaker may not be willing to cooperate with this utterance. The same thing happens in English, too. With fall-rise contrastive contour, (15a) implicates some positive value. Compare:

(15) a. I don't know her ╲well╱. +> But I know her a little.
b. I don't know her well. +> I know a little or nothing about her.

(16) a. I don't have ╲many╱ matches left. +> But I have just a few matches left.
b. I don't have many matches left. +> But I have just a few (or no) matches left.

Chierchia's (2004) claim that implicatures of negative scales are "somewhat weaker and flimsier than their positive counterparts" and are "indirect scalar implicatures" does not consider the kind of situation where CT occurs overtly as in (15a)/(16a) or covertly. The counterpart of the CT-marked quantifier in (16a) in Korean is *manh-ci-*__nun__ with the CT marker. When there is no CT marking with intonation or marker involved, implicatures of negative scales can be logically any positive value including near-null or null (though null is negative, it can be included due to vagueness or granularity) below the given value and can give the impression of 'weaker and flimsier.' Chierchia's account is based on one side of the phenomenon and totally lacks the idea of CT, although he greatly relies on conventionalized aspects of scalar implicatures in his effort to incorporate them into the computational system of grammar. Hence, Horn's (2005) disagreement on the asymmetry between negative and positive is understandable. However, Horn does not make use of CT either. If CT is involved, it becomes conventional and you cannot avoid positive implicatures of a lower but non-null value in the scale, denial of a still stronger

value in the reversed scale <∼all, ∼many, no(ne)(=∼one/some)>, as opposed to <one/some, many, all>. Null does not count as a possible positive contrasted value when CT comes in. As indicated, negative sentences tend to be topical with unmarked intonation. Horn's (2005) attack on Chierchia's (2004) distinction between 'direct' and 'indirect' scalar implicatures is reasonable. There is one single principle of up-denial implicatures; a stronger value on a negative scale, i.e., a negated weaker value, is denied to yield a positive weaker value in scale reversal in negative sentences, with nothing indirect. If a positive scale with CT basis is taken into account, implicatures from negative and positive are systematic.

2.4 Negative utterances presuppositional or more topical

Negative sentences are normally discourse-bound and show asymmetry with their corresponding positive sentences, presupposing the latter but not vice versa (Horn 1989). I would further say that negative sentences are typically contrastively or concessively topical and that is why negative sentences with intonationally unmarked quantifiers like (17a) and (16b) evoke implicatures of the same content in general as those negative sentences with CT intonation like (19a) and (16a). The speaker affirms a scalar value to establish an upper bound on some scale and denies a scalar value to establish a lower bound. This is reduced to the same principle of inducing an implicature denying a stronger/higher value on a scale because 'negatively scalar' (Horn 1989) elements have a reversed scale (Fauconnier 1975) from 'positively scalar' ones (see also Lee 2000), as shown in <1, 2, 3> vs. <∼3, ∼2, ∼1>. Consequently, in denying scalar values in [*V*i (true)- - - - - -*V*j (Denied)- - - - - - -*V*k], the denial of *V*j will implicate that lower values in *V*i are true. Horn (1972) earlier claimed that (17a) uttered with 'unmarked' intonation (speakers report that the negative is accented) will license (17b) [*But* added], as cited by Hirschberg (1991). Observe:

(17) a. I don't have three friends.
b. But I have fewer than three (or no) friends.

(18) a. I don't have many friends.
b. But I have just a few (some) friends.

(19) a. I don't have ╲three╱ friends.
b. But I have fewer than three friends.

Hirschberg factually disputes a bit with Horn and Horn himself retreated on cardinals for non-implicating 'exactly' readings in special contexts such as 'mathematical, collective, and elliptical' later (Horn 1992, 2005), admitting a significant difference between cardinals and "inexact" scalar values, particularly in view of current psycholinguistic support. But Horn's initial intuition and Gazdar's (1979) as well on negated cardinals as in (17a) with 'unmarked' intonation seems to have been plausible and (17b) is an unmarked default or 'prominent' reading. Other "inexact" scalar values such as quantifiers like *some* and *many*, modals like *possible*, connectives *like* or and (degree) predicates like *warm* are scalarly well-behaved, as in (16) and (18), with no controversy. Now observe (19a) with fall-rise intonation. It implicates (19b), although Hirschberg (1991) claims that even with fall-rise on *three* (19b) one can get "an upper- or a lower-bound reading." However, people have a hard time imagining a situation that suits an upper-bound reading. (16a) corresponds to (20a) in Korean and (18a) with fall-rise CT intonation corresponds

to (21), with the Korean counterparts invoking roughly the same implicature of (20b). With non-cardinal quantifying DETs such as *many* in (18) and *manh-* 'many/much' in negative sentences can also implicate weaker positive quantifying DETs down to zero both in English and Korean. Chierchia's observation on this in English may be correct but not entirely because the fact holds only when they have unmarked (no CT) intonation. But those with CT intonation in English and CT marker in Korean on negative quantifiers cannot lead to a nil quantifying implicature situation at all. Compare:

(20) a. *na-nun sengnyang-i manh-i nam-ci anh-ass-ta.*
'I don't have many matches left.'

b. +> *haciman na-nun sengnyang-i yakkan nam-a iss-ta.* (maybe 'none')
'But I have a few matches left.'

(21) na-nun sengnyang-i manh-i-**nun** nam-ci anh-ass-ta.

(22) = (16a) ≒ I don't have ╲many╱ matches left. (no 'none' implicature)

However, when (17a) is uttered with stress on three with focus, as in (23a), it will license (23b) (Horn 1972). When cardinals are focused, they are interpreted in the 'exactly' meaning (Wee 2005) and tend to 'block' an up-denying implicature, co-occurring with an up-affirming clause. They turn out to be 'metalinguistic' in nature. They sit in a CF frame. Observe:

(23) a. I don't have THREE friends.

b. I have more than three friends.

In Korean, stressed focalized cardinals must get case markers attached. Then more attention is given to the exhaustive or 'exactly' interpretation but speakers are rarely conscious of denial of a higher value as implicature, unlike in a CT context. This is true particularly when they constitute a predicate. Normally affirmative sentences with case markers attached to scalar quantifier expressions tend to be interpreted in the 'exactly' meaning in Korean, giving new information.

2.5 Contrastive predicate topic revisited

CT is not limited to a nominal type; it is also applied to a property (predicate) type:

(24) She ╲arrived$_{CT}$╱. +> ¬She went on the stage.

(25) She ╲passed$_{CT}$╱. +> ¬She aced the exam. (Cf. She passed$_f$ Rooth's 1996)

The question whether she went on the stage may be a potential topic in the previous discourse. (24) evokes a scale of <*arrive, go on the stage*> in context and (25) readily evokes <*pass, ace the exam*>. If we consider a specific context in which 'go on the stage' requires 'arrive' as a precondition, the former entails the latter in that context and we can call it a pragmatic entailment. The latter scale may be semantic; 'ace the exam' entails 'pass the exam.' (Conventional) scalar implicatures are invoked by both pragmatic and semantic entailments. On the predicate part we can also have such a CT:

(26) All the abstracts ╲did$_{CT}$╱ get accepted. +> But there may be withdrawals.

CT-marking on the aux (by *do*-support) in English or on a predicate ending in Korean may function as a verum CT in the sense that polarity of affirmative and negative (yes/no) is contrasted, as in (26), evoking a polarity-reversed alternative proposition (rather than predicate) as an implicature (negative here originally). Rooth's (1996) simple alternatives by F-marking (and conversational implicature) cannot explain why fall-rise requires the relevant type of scalar implicatures (see Lee 2000). Let us see how CT is equivalent to concessive construction (its contraposition is impossible, unlike in a regular conditional). Even if we make concession by going down the scale to a predicate of lower value adversely by attaching the CNC marker 'even', still it is not the case. Then, the higher values are also denied. Temporal, causal, logical and any other ranking sequences of processes/events can form scales of all predicates in general to create CTs such as <touch hands, (hug,) kiss>. Consider:

(27) *son-ul* *manci-ki-**nun*** *hay-ss-e.*
hand-ACC touch-NMR-CT do-PAST-DEC
'I ＼touched her hands／.' (NMR = Nominalizer)
+> *haciman khissu-nun ha-ci anh-ass-e.*
'But I didn't kiss her.'

(28) a. *son-ul manci-ki-nun hay-ss-e-to khissu-nun ha-ci anh-ass-e.*
'Although I touched (her) hands I didn't kiss her.'

b. *te-o sawa-ri-wa shita keredo/*-mo kisu-wa shi-na-katta.* [Japanese]
(cf. toshi-temo 'even if')

In contrast, adversely going down to a lower predicate with the CNC marker *-to* or 'even' creates an NPI. Observe:

(29) *son-ul* *manci-ci-**to*** *mot hay-ss-e.*
hand-ACC touch-CI-CNC not.able do-PAST-DEC
'I didn't (couldn't) even touch her hands.' [CNC = Concessive]

(30) A: Did you read the book?
B: I didn't even open it!

The CT marker *-nun* looks upward to establish an upper bound and generates an up-denial implicature, whereas the downward CNC marker *-to* with a weaker predicate becomes an NPI, requiring negative, other monotone decreasing or uncertainty contexts. This principle holds for all predicates in all languages. We will further discuss the relation between *-nun* and *-to* shortly.

2.6 Scope: Negation wide vs. CT narrow

CT has narrow-scope over other scope-bearers, although Buring (1997) disagrees. I claim that the narrow-scope CT is scalar, as in (31). If a CT is fronted to the initial position of a sentence it tends to get topicality effects with wide scope unlike when *in situ*.

(31) *euysa-euy* *sam-pwun-euy i-**nun*** *hayko-ha-ci anh-ass-ta.*
doctor-of 3-division-of 2-CT fire-do-CI not.do-PAST-DEC
'(The Government) did not fire two thirds of the doctors.'

In (31), the CT narrow-scope non-partition scalar reading (¬2/3) [up to 2/3] is obtained, with an assumed null or realized Topic in the initial position. We can get a CT (partition) wide-scope reading (2/3 ¬), if we have the CT constituent before the subject such as 'the Government.' It tends to have a topicality effect, with a low tone on *-nun* or *-wa*. CT basically takes narrow-scope over scope-bearing elements and reveals scalarity.

A REASON adjunct clause is another scope bearer and it interacts with negation in various languages. Many linguists say (32) is ambiguous but (a) REASON > NEG if the REASON is focused and the negation has no CT marker preceding and no high tone, (b) if *-ci* gets a compensatory high tone, REASON < NEG, and (c) if the pre-negation part is focused an MN reading occurs. Consider:

(32) *pwuca-yese* *kyelhon-ha-ci anh-ass-e.*
rich-be.because marry-do-CI not.do-PAST-DEC
a. '(He) didn't marry (her) because she is rich.' REASON > NEG (no high)
b. '(He) married (her) not because she is rich.' REASON < NEG (high tone)
c. '(He) didn't marry (her) because she is rich; (he married her because…)' MN

Without any intonation marking, the sentence may be ambiguous. With intonation marking, it is not. If a Contrastive Predicate Topic marker *-nun* is attached to *-ci* to make it *-ci-**nun***, (32) gets the REASON < NEG reading, as in (b), just like when a high tone lies on *-ci*. If the CT marker is deleted, its **compensatory high tone** remains and its interpretation is the same as when it has the CT marker with a high tone. Because CT is topical and focal, it becomes focally associated with the reason clause and the reason comes to have the CT effect. The interpretation of the CT-marked S is [I married her not because she is rich$_{CT}$]. Then, its implicature may be: [I married her because she is nice], 'nice' being weaker than 'rich' in the pragmatic scale. There is an exact correlation between intonation and interpretation, and intonation may be claimed to be compositional. If a heavy stress lies on *pwuca-yese* 'because she is rich' and a pause follows and then the intonation goes down for the rest of the sentence, its reading is (a). Still another reading is a CF situation where the MN (the entire pre-negation) part is there but the positive alternative is assumed from the discourse (e.g., 'He married her not because she is rich but because (say, she is pretty),' *Puca-i-ese-ka ani-i-ra yepp-ese kyelhon-hay-ss-ta*). All the scope relations involving quantifier-negation and REASON-negation depend on whether the sentences in question have inherently Contrastive Predicate Topic, related to the previous discourse context. If that is the case, the sentences must take the wide-scope negation, with the Contrastive Predicate Topic focally associated with the relevant quantifiers/REASON clause or arguments/adjuncts. Otherwise, the quantifier or REASON is focused (for (a)) for its wide scope over negation or it has CF to be metalinguistically negated and the other alternative is asserted or assumed, as here. Thus viewed, scope ambiguity is not present. Constituent negation also involves Contrastive Predicate Topic, with the latter being focally associated with the relevant constituent; even constituent CTs without negation may come from the predicate part.

2.7 The psychological reality of CT

If the use of a CT (object) in an embedded sentence matched the previous context with a set of alternatives, the reading time for the embedded verb part was found to be significantly shorter than that when it did not match the previous context, i.e., when the context had no set of alternatives, in an experiment conducted by Kim & Yim (2004) in support of my claims on CT.

Context 1: While three students C, I, and Y were having a discussion, their professor entered the class. Context 2: While two students C and Y were having a discussion, their professor entered the class. The two conditions (a) [matching the context] and (b) [mismatching the context] were realized as follows:

a. 'The professor' [$_{IP}$ C-NOM	– Y-**nun**	– 'trickily'	– 'harassed']	'thought'		
704(ms)	639	847	774	**935**	814	
b. 'The professor' [$_{IP}$ C-NOM	– Y-**nun**	– 'trickily'	– 'harassed']	'thought'		
711	600	846	735	**1029**	838	

Table 1: Reading times for phrases for CT match/mismatch sentences

It was also neurologically reported in an ERP brain wave study (Ito & Garnsey 2004) that a Focus mismatch for a *wh*- question 'Who lost the key?' with a Focus-less *Masayo-ga* instead of a Focused *MSAYO-ga* in Japanese caused remarkable negativity effects (Lee to appear).

3 Contrastive topic goes with *PA* 'but' and contrastive focus with *SN* 'but'

3.1 CT-PA correlation

Some linguists have found a very interesting distinction between PA and SN adversative conjunctive connectives in various languages such as Spanish, German and Hebrew, so far known, although a few exceptional languages such as English and French do not show the distinction in form (Anscombre & Ducrot 1997; Koenig & Benndorf 1998; Schwenter 2002). However, so far people failed to indicate how Contrastive Topic (CT) is related to PA and Contrastive Focus to SN. Consider the CT∼PA correlation first:

(33) a. I am not ecstatic, *but* I am happy. [pero, aber = PA]

b. I am not ecstatic$_{L+H^*LH\%}$. +> '*but* I am happy.'

(34) a. *na-nun* *hwangholha-ci-**nun** anh*-ciman *hayngpokhay*.
I-TOP ecstatic-CI-CT not-but happy

b. *na-nun* *hwangholha-ci-**nun** anh-a* +> 'haciman *hayngpokhay*.'
I-TOP ecstatic-CI-CT not.do-DEC but happy

In (33), a scale of <happy, ecstatic> (*ecstatic* entailing *happy*) is triggered by the contrastive topichood of the predicate of the first conjunct. The predicate is linked to a potential Topic in the previous discourse. Prosodically, a CT utterance such as (33b) constitutes an Int(onational)P, just as in Korean, e.g., in *ney irum-UN?* 'Your name?' (Focus ellipsis), whereas a CF involved in metalinguistic negation is typically an A(ccentual)P. The scale is reversed by negation, with *not ecstatic* being weaker than *not happy*, i.e., <¬ecstatic, ¬happy>. However, *happy* and *unhappy* cannot be on the same scale; the former is positive and the latter is negative. A polarity-mixed scale is a disaster; strength (or highness) directionality is not kept. The first conjunct, with the Contrastive Predicate Topic, then, is contrasted with the second conjunct by means of the PA *but*. The first conjunct generates, as a potential scalar implicature, the denial of a stronger element *not happy* in the scale, resulting in *happy* after the double negation ¬¬*happy*. But the potential implicature part is explicitly expressed as a second conjunct *but I am happy*. If the first

conjunct alone is uttered, as in (33b), the potential implicature becomes a real implicature. Here the different degrees of *happy*, *ecstatic*, with negation, must be 'denotational' (Lee 1999a) or 'descriptive' (Horn 1989). In that interpretation, if *ecstatic* and *happy* are replaced by each other in (33a), the result is bad:

(35) **I am not happy, but*$_{\text{PA}}$ *I am ecstatic*. (With CT-intonation in particular)

This happens with all other PA conjunctions in different languages. What happens if there is no particular CT marking by intonation or morphological marker on the predicate of the first conjunct or a simple sentence in (33a, 33b, 34a, 34b) and its equivalents in other languages (36–41)? Levinson would suggest a *generalized conversational implicature* (GCI), here *scalar*, as a default interpretation. However, if a simple affirmative sentence with a scalar term is uttered, people do not seem to pay any special attention to its scalar implicature, although they accept the 'exact' interpretation by default. A simple negative sentence even with no CT marking tends to be more topical than its affirmative counterpart because a negative sentence occurs to deny given information. In Hebrew, a particularly strong stress (I assume it is contrastively topical) is required on the predicate, as in (37b), to get the relevant implicature, according to Hazout and Dascal (p.c.). In other words, CT marking by intonation/stress or markers is required to convey its conventional scalar implicature. Therefore, if conventional CT marking occurs but the context fails to support the required relevant polarity and alternatives, the utterance must be infelicitously true even if it is true. Its truth cannot be innocuous. The pure conjunction *and* (and its equivalents in other languages) and the contrastive conjunction *but* (and its equivalents in other languages) are truth-conditionally identical in traditional truth-conditional semantics but this level alone cannot capture the real distinctions between the two.

The Korean counterpart (34a) well demonstrates that the predicate is a Contrastive Topic with the CT marker ***-nun*** and that CT requires the PA conjunction *-ciman* (or S-initial dialogal *haciman*/*kurechiman*). At times, another connective *-nuntey* may be used, though not typical for PA, contra H. Lee (2004), to show 'telling-my-side' or what the speaker found out as circumstantial and evidential ground to be shared with the hearer in the first conjunct to express his inference in the second conjunct. Or it is used without the second conjunct so that the hearer can infer the speaker's intention (cf. Park 1999). The predicate of the second conjunct can also take the CT marker, as in *hayngpokha-ki-**nun** hay* '(I am) happy$_{\text{CT}}$' instead of *hayngpokhay* '(I am) happy.' (Alternatively the second conjunct alone may take the CT marker or both conjuncts may lack it to be contextually supported.) Still alternatively, without any explicit PA connective, a CT-marked sentence can be followed by its contrasted sentence of denial of stronger element in juxtaposition (as in *Sey myeng-un ani-i-ya*. *Twu myeng-i-ya*/**Ney myeng-i-ya* [three-CL-CT not-be-DEC. two-CL-be-DEC/four-CL-be-DEC]'(It) is not three-CT. (It) is two/*four' (see (46) below and Choi 2004). One crucial characteristic of CT, followed by a PA, is that its sentence is a concessive admission/compliance. Scalarity follows from concessivity. Thus, the first conjunct of (33a) can be paraphrased as 'although/even though/if I am not ecstatic.' Therefore, it can be called 'concessive (cf. Horn 1989) contrast,' in contrast with juxtaposing contrast. On the other hand, SN conjunctions of metalinguistic negation/correction to be discussed shortly lack this kind of concession.

Japanese also shows the distinction of PA *-ga* (or S-initial dialogal *shikashi*/*datte*) and SN *naku* (negation incorporated as in Korean) (A. Ikeya p.c.). In colloquial Dutch, the same *maar* is used for both PA and SN, as *but* and *mais* in French. But in formal Dutch, the SN 'but' is *echter*. Let us further observe crosslinguistic data below:

(36) *Ich bin nicht in Extase,* aber *glücklich.* (German: U. Sauerland p.c.)
'I am not in ecstasy, but (I am) happy.'

(37) a. *ani lo lilhav* aval *ani samex.* (Hebrew: I. Hazout p.c.)
I not ecstatic but I happy
'I am not ecstatic but I am happy.'

b. *ani lo lilhav.* 'I am not ecstatic.'

(38) *Ni-sem ekstatičen, sem* pa *srečen.* (Slovenian: I. Zagar p.c.)
not-I-am ecstatic I-am but happy

(39) a. *Mai dep* ***thi*** *khong dep* (nhung *de nhin.*) (Viet: Thu Ba Nguyen p.c.)
Mai beautiful CT not beautiful (but good-looking)
'Mai is not beautiful, but she looks all right.'

b. **Mai thi khong de nhin nhung dep.* [*impossible*]
Mai CT not good-looking but beautiful
'Mai does not look all right but beautiful.'

(40) *Ta lao* ***shi*** *lao,* bu guo *shenti hen jiankang.*
he old CT old but body very healthy
'He is old but he is very healthy.'

(41) *Ol khyz ush yer bal-ny tasta-gan-men torteu-in tasta-mady.* (Kazakh)
the woman 3 that guy-ACC dump-PAST-but 4-ACC dump-PAST-NEG
'She dumped three guys but she didn't dump four guys.'

In (36), *aber* is required and *sondern* is not permitted except in the case where there was a previous claim that I was ecstatic and that part of expression *in Extase* is negated (metalinguistically) for correction. All the above cross linguistic facts show that the PA conjunction is motivated by the concessive nature of the CT in the first conjunct and because of the concessiveness of the first conjunct scalarity arises with a stronger alternative element denied in the second conjunct. A weaker admitted and a stronger denied (by double negation if a first conjunct is negatively uttered), by which the speaker's argumentative direction/goal is achieved. Thus, the explicitly uttered second conjunct or a scalarly implicated identical proposition generated by CT has greater argumentative force. Naturally, if the first conjunct is affirmative, concessively admitting the previous mention (in a question) of it, then a higher stronger predicate is denied with PA, as follows:

(42) a. I am happy, but I am not ecstatic.

b. I embraced her, but I didn't kiss her.

c. *I kissed her, but I didn't touch her.

The scale mobilized is basically semantic with quantifiers, numeral indefinites and predicates (including modals, etc) but a particularized context can intervene for an argumentative goal-oriented pragmatic scale with short-circuit pragmatic entailments (semantically, *kiss* -/-> *embrace*; *kiss* -> *touch*). The wide scope denotational negation (over a scalar CT-marked element) (with the

nature of external negation) is necessarily scalar, whereas the metalinguistic negation we will see now is not. The kinds of propositions explicitly given after the PA conjunction seem to be more flexible than those of corresponding implicatures that are invoked by the CT utterances. An S-initial discoursal PA marker in Korean is *kurechiman* 'But.'

A Q-implicature or its expression easily occurs with a CT or CT-related PA pattern. Consider.

(43) a. She is a Republican but is honest.

b. She is not tall but a good basketball player.

c. (A) The man who is drinking martini is my uncle.
(B) Yes, you are right (*or* he is) but he is drinking water.

d. (A) *mwun com tat-e.*
'Close the door.'
(B) *mwun-un tat-kess-ciman* (*-nuntey*) *pan-mal-un samka-cwusipsio.*
'I will, but don't use the half-speech.'

As in (43) generic entailments (Koenig & Benndorf 1998) of common belief, presupposition or speech act pre-conditions of manner, etc. evoked by the first conjunct or previous discourse are, I would claim, scalarly higher in a sense and naturally denied by the second conjunct or the response utterance after PA. Therefore, the same principle of denial of a stronger/higher element applies to these cases as well as quantificationally scalar elements of numerals, quantifiers, predicates, and scalar nominals. An R-principle-based implicature candidate, however, does not normally appear as an explicit expression as it is. If it has to appear it should be conjoined to the given utterance with 'and.' On the other hand, it can also be explicitly denied as a stronger scalar alternative in the second conjunct after PA (e.g. *pen han kay-rul ilh-e peri-ess-nun-tey*/*-ciman nay kes-un ani-iya* 'I lost a pen but it is not mine'; my pen->a pen; *She got pregnant and got married but not in that order*). In other words, R-inference-based implicatures can be fed into the PA pattern by denial of them. Thus viewed, all the potential Q- or scalar implicatures plus pre-conditional propositions of sentences can explicitly appear in the second conjunct of a PA conjunction by the same scalar principle of denial of a stronger element. In like manner, even potential R-implicatures can be input to the second conjunct of a PA conjunction by the same denial of a stronger element principle. The concessivity of CT underlies this scalar principle.

Interestingly enough, the conjunction marker *-ko* can be immediately followed by the CT marker (44a) or CNC marker (44b), to be continued by negative assertions:

(44) a. *caknyen sel nal* *cangkeri cenhwa-rul* *ha-ko-**nun***
last.year New.Year's.Day long.distance.call-ACC do-and-CT
yenlak-i eps-ta.
contact-NOM no-DEC
'(He) made a long distance call on the New Year's Day last year and-CT there has been no contact.'

b. *ku i-nun* *nam-uy tari-rul* *pwuncile noh-ko-**to***
that person-TOP other-of leg-ACC break put-and-CONC
chaykim-ul cici anh-nun-ta.
responsibility bear not
'He broke other's leg and-CNC does not bear any responsibility for that.'

The CT marker attached to *-ko* 'and' in (44a) establishes the proposition in the first conjunct as a concessively past given member in the common ground between the interlocutors and some relevant but contrasted, often negative, proposition follows. In (44b), we go down the scale of alternatives adversely to the first proposition of perfective event and still it is not the expected case in the second conjunct (by default, if (-conditional) the first event occurs, one is responsible for it). Without *-ko*, there occurs an irrealis (conditional) concessive meaning.

When a potential conjunctive Topic with a single predicate in a question such as 'Do robins and penguins both fly?' is closed in the answer by a split list CT construction such as 'Robins fly but penguins don't', the CT that take the given predicate must be the first conjunct of PA, not the one that denies it such as ?*'Penguins don't fly but robins do.' This shows that CT and PA go together in concessive admission of the given in the previous context. Therefore, if the same question is in the negative, the latter answer is adequate but not the former (cf. Kawamura 2002).

It is also interesting to learn that a scalar Q-implicature (e.g., - three +> (**but not four**)) but not an R-implicature (e.g., - a finger - +> (**my finger**)) is reported to be part of what the speaker says by subjects in experiments conducted by Gibbs & Moise (1997).

3.2 CF–SN correlation

We can now turn to SN conjunctions that co-occur with metalinguistic negation and an alternative (or rectification/correction). The contrasted alternatives are 'symmetrical' (Dascal & Katriel 1977); they express a pair of elements in Contrastive Focus explicitly. One element is totally rejected by denial and is replaced by another of the same order. The pair are in Contrastive Focus in the sense that the speaker accommodates an alternative question 'Are you happy or ecstatic,' after hearing some comment like 'You must be happy after your wedding.' Because the alternatives in the pair are contrastively focused, "extra heavy stress" falls on the negated item (Lasnik 1975) and presumably on the replacing item. The idea of alternative disjunctive questions as a testing device for CF clearly distinguishes it from CT, although CT and CF do have a notion of *contrast* in common with a contextually closed set of alternatives (Lee 2003b). SN conjunctions differ from PA in form in various languages including Korean. Consider:

(45) a. I am not HAPPY, I am ECSTATIC.

b. I am not HAPPY *but* (#I am) ECSTATIC. [sondern, sino = SN]

c. I am not HAPPY *but* MISERABLE.

d. I am not ECSTATIC *but* just HAPPY.

(46) *na-nun* HAYNGPOKHA-*n kes-i* ani-i-ra/*ani-i-ciman HWANGHOLHAY.
I-TOP happy-REL NMZ-NOM not-be-CONJ ecstatic
'I am not happy but$_{SN/*PA}$ ecstatic.'

(47) a. *Ich bin nicht* GLÜCKLICH, *ich bin* IN EXTASE.
'I am not happy, I am in ecstasy.'

b. Ich bin nicht GLÜCKLICH, *sondern*/**aber* (ich bin) IN EXTASE.

(48) a. *ani lo* SAMEAX ela (*#ani*) NILHAV. (Hebrew)
I not happy but ecstatic

b. *ani lo* NILHAV ela *rak* SAMEAX.
I not ecstatic but only happy
'I am not ecstatic but only happy.'

(49) *Ni-sem* SREČEN, temveč EKSTATIČEN. (Slovenian)
not-I.am happy but ecstatic
'I am not happy but ecstatic.'

(50) *Yer bala-ny* USHEU-*in* *tasta-gany* emes, TORTEU-*in tasta-gan.* (Kazakh)
that guy-ACC 3-ACC dump-PAST not 4-ACC dump-PAST
'She dumped not three guys but four guys.'

(51) *Wo bu shi* XIHUAN *ta,* *er shi* AI *ta.* (Chinese)
I not SHI like him but SHI love him
'I do not like him but love him.'

(52) *Mia-nun* PUCA-***ka*** *ani-i-ra* ***PU:CA****-iya.* (as RICHE in French)
Mia-TOP rich-NOM not-SN RICH-be-DEC
'I do not like him but love him.'
'Mia is not rich but RICH.' (PU:CA 'very rich')

In (45a), two full sentences are juxtaposed without *but* unlike in (45b), where *but* appears but then the second conjunct must be a constituent rather than a full clause, matching that in the first conjunct under the immediate scope of the metalinguistic negation. This tendency is witnessed cross-linguistically, as we can see in Hebrew (48a) and German (47b). This is in sharp contrast with (33a), where the PA *but* is followed by a full clause. Prosodically, the PA *but* mediates IntPs, whereas the SN *but* mediates Accentual Phrases in general. A similar but weaker intent of metalinguistic negation can be conveyed by the comparative construction *A rather than B* (e.g., *He's more negligent than vicious*) or *B-i-ra-ki-pota A* in Korean without any explicit negative.

In (33b), even without a CT contour and without the second conjunct the utterance 'I am not ecstatic' can constitute an S with a conversational scalar imlicature of 'but I am happy,' depending on the context. The same thing happens with (34b) in Korean without the second conjunct, still generating the second conjunct as a conversational implicature, depending on context, without *-nun*. This is a Weak Contrastive Topic situation for me. If the first conjunct without the second one happens to have a contrastive contour of L+H*LH% or a hat accent in German on 'happy', 'happy' becomes a Contrastive Topic (or Strong Contrastive Topic) and you cannot avoid conveying the conventional scalar implicature of 'but I am happy' (affirmative weaker) (Lee 2003c, 2000). If we have the 'but' part explicitly as in (33a), it is a PA (*pero* in Spanish and *aber* in German, see Schwenter 2002). This corresponds to (34a) in Korean.

In (45a), we have a focus stress on 'happy' and 'ecstatic' and in the first conjunct the normal implicature of affirmative weaker 'I am all right' is blocked and dramatically 'I am ecstatic' is contrastively asserted. In this case, the second conjunct is essential and cannot be deleted (to become an implicature, differently from (35b)). (45a) fits my definition of CF, with an accommodated question 'Are you happy or ecstatic?' (45b) is an SN (*sondern* and *sino*). In Korean, we use '*-nun*' (or *-wa* in Japanese) attached to 'ecstatic' and 'but' (*-ciman*) for (34a) for CT but the Nominative marker *-ka* (or still *-wa* in Japanese), Negation marker *ani*, Copula *-i-* and *-ra* (embedded DEC) for (46). This negation in the form of *andi-ra* is witnessed very early in Korean,

around the 13^{th} Century (Seungjai Lee p.c.). ((46) is metalinguistic negation. I distinguished it from CT (Lee 1999a).

A sentence such as *She was not able to solve the problem* evokes an R-based implicature *She did not solve the problem*. Therefore, its denial *She solved it* cannot be the second conjunct because it leads to a contradiction. But if *ABLE* is extraordinarily stressed (with the modifier *just* before it, preferably) and *SOLVED* in the second conjunct is also stressed (again with the modifier *actually*, preferably), forming a proper CF frame, then SN metalinguistic negation construction arises. This means that Koenig and Benndorf's (1998) argument that R-based inference cannot occur in SN categorically is not correct. We can see how it is sensitive to focus stress. Horn's (1989) example *Chris didn't MANAGE to solve the problem - - - it was quite EASY for him* is another such example (see Horn 2002 for categorization of MN).

In Slovenian, unusually, there is no distinction in form between the coordinate conjunction 'and' and the contrastive PA conjunction 'but.' They are both *pa* but the SN 'but' is distinct from this and is *temveč*, as in (49). So far, the PA/SN conjunction distinction has been shown to be correlated with CT and CF, respectively. This correlation has not previously been explicated.

3.3 CF: The primary condition for MN

Cross-linguistically, in CT-PA conjunction, the scalar up-denial principle is applied and the first conjunct is topically and admissively rendered and concessive, no matter whether the second conjunct is uttered or in implicature. The first conjunct (possibly together with the second) is topically related to the previous discourse in the sense that the negated predicate is part of the potential Topic in the previous discourse. If the second conjunct is uttered, it tends to constitute a full clause as an Intonational Phrase (IP). If the first conjunct is negative, the negative is typically stressed. Observe (45b) again and (54). Interestingly enough, the predicates in (53) are inherently negative (Lee 1999c) and forms a negative scale like <hässlich 'ugly', *dumm* 'dumb'>. The denial of a higher value *dumm* 'dumb' on the scale yields a weaker value *hässlich* 'ugly' in the second conjunct explicitly or in implicature.

(53) a. Maria ist *nicht* dumm, *aber* sie ist hässlich. (Kasimir 2005)

b. ≒ Maria-nun papo-**nun** ani-i-*ciman* hopak-i-ta. [negative scale: <ugly, dumb>]

In CF–SN conjunction, in contrast, from a potential disjunctive alternative question an alternative is metalinguistically/echoically denied and the other alternative is asserted.

Kasimir (2005) also pays great attention to the focus nature of the target of SN negation. Therefore, if my position of CF – SN correlation theory of 'MN' is adopted, the (pair of) alternatives can be chosen from any domain of Horn's 'canonical' implicature 'blocking,' linguistic (including prosodic) forms and, I would say, parasitically truth-affecting terms. The denial is "an objection to a previous utterance on any grounds whatever" (Horn 1989), "including the choice of a lexical item as yielding a *false* proposition?" (Horn, e-mail reply p.c. May 5, 2005, to my question on (55), *italics* added). Horn almost came to concede up to the point of admitting 'the choice of a lexical item as yielding a *false* proposition' in the scope of metalinguistic negation. The crucial distinction between DN and MN, then, is that DN is topically poised and MN is focally poised. A heavy stress is typically imposed on the first CF constituent (and the second) of such CF – SN ('MN') construction and the second conjunct tends to be an Accentual Phrase rather than an IntP. Observe the implicature 'blocking' examples again in (45-52) and

the new examples below. In (54) and (55), one objects to the choice of *dumm* as yielding a *false* proposition ('parasitically denotational/descriptive' for me).

(54) a. Maria ist *nicht* DUMM, *sondern* HÄSSLICH. (CF)
b. ≒ Maria-nun PAPO-**ka** *ani-i-ra* HOPAK-i-ya.

(55) a. I am not happy/ecstatic; (in fact) I am miserable. (CF)
Cf. I am not ╲happy╱, but I am all right/*miserable.
b. na-nun hayngpokha-n kes-i ani-i-ra pichamhay.

In sum, information structure rather than truth-conditions crucially functions for the distinction between DN and MN; DN relies on CT – PA, MN on CF – SN. CT creates a denotationally scalar contrastive set of alternatives in the domain of discourse. The CF – SN MN construction has a set of paired alternatives, of which one echoic alternative expression is denied for 'whatever' reason and has no scale.

The MN CF conjunct may be elliptical at times. Note that Ladd's (1980) example (56) (marking added) shows that the same utterance can be rejoined either by CT or by CF: there is a whole-part relation between 'the state of New York' and 'Ithaca' by means of CT (56A, B) or a CF contrast between an elliptical MN such as 'not in the state of New York but,' as in (56A, C). A discoursal MN discourse marker *ku key ani-i-ra* 'not that but' in Korean can precede the CF rejoinder. Observe:

(56) A: Harry's the biggest fool in the state of New York.
B: In ╲Ithaca$_{CT}$╱ , maybe.
C: In THE WHOLE WORLD$_{CT}$, maybe. [CF] (MN assumed)

The fragment PP with the CT contour in (56B) is equivalent to the *-nun* (Korean) or *-wa* (Japanese) CT-marked expression (*Ithaca-ese-**nun*** 'Ithaca-Loc-CT'). Then, the relevant scale in context must be <Ithaca (part), state of New York (whole)> (<Weak, Strong>). 'Ithaca' has been admitted in the utterance and the implicature, subtracting it from the whole, is 'but not in the rest of the state of New York.' For the CF MN answer (56C), we can posit a potential alternative question 'In the state of New York or in the whole world?' at some stage. The positive alternative is chosen from the upward range of values to be denied for an up-denial implicature that is actually blocked.

The following MN example compels us to think further about the limit of extensional truth-conditions. The alternative predicates with CF from an alternative question may be referentially/extensionally identical but are different in intensional meaning. That is why it can become a funny joke. The other's representation is echoically denied to be replaced by an intensionally different predicate. Observe:

(57) She is not PLUMP; she is TALL IN EVERY DIRECTION.

Presupposition-cancelling cases of MN are marked ones. Presupposition is not easy to be the target of negation and be in the direct scope of negation (see Carston 1996). Consider:

(58) The King of France is not bald; there is no King of France.

Even if we try the external negation of the first clause with existential presupposition in the definite description, as in (59a) and (59b) in Korean, the negation cannot cancel the presupposition. Observe:

(59) a. It is not the case that the King of France is bald.

b. ≒ France wang-i taymeri-i-n-kes-**un** ani-i-ta.

In (59b), the CT marker -(*n*)*un* (CT negation will be discussed later) can be focally negatively associated with either the predicate ('not bald' scalar +> 'but with a bit of hair') or the subject ('not the King of France' +> 'but the prime minister of France') or the entire clause in the embedded complement clause ('∼that the King of France is bald' +> 'but that…'). Because of the CT marker within the scope of negation there always arise associated alternative individuals, events or situations/worlds and there is no way of cancelling the presupposition. The only way left in Korean is having the entire clause in CF and replace the CT marker -(*n*)*un* by the focal NOM marker -*ka* and make the MN negation and a presupposition-cancelling clause follow. The resulting MN representation will be:

(60) ?[*France wang-i* *taymeri-i-n-kes*]-***i*** *ani-i-ra* *France wang-i eps-ta.*
France king-NOM bald-be-COMP-NOM MN France king-NOM not.be-DEC
'Same as (58) in English.'

As claimed in Lee (1999a), CT in Korean, in English as well, I would claim, is basically denotational and cannot involve MN. Therefore, the nominals *highway* and *kosoktoro* 'highway' in (61) are regarded as different entities with different properties by native Koreans, contra Lee (2005a). Otherwise, (61) is judged to be odd. The same thing occurs in the English CT construction, as in (62). Observe:

(61) *hankwuk-ey-nun* *highway-**nun*** *eps-ko* *kosoktoro-**nun** iss-ta.*
Korea-LOC-TOP 'highway'-CT not.be-and 'kosoktoro'-CT be-DEC
'There is no 'highway' but *kosoktoro* in Korea.' (adapted from Lee 2005a)

(62) As for highways, Korea doesn't have them, but as for *kosoktoro*, Korea has it.

We now come to understand how CT is denotational and how MN needs CF. If (61) is purported to be an MN case, it may marginally parasitically work only as game-playing of bad taste. Even non-ranked list CTs cannot constitute a normal MN.

There are some adverbial NPIs that originate, I claim, from an underlying MN construction such as *pothong* 'commonly' and *yekan* 'ordinarily,' of which the first syllable is stressed to be the CF target of MN. The second clause with the positive alternative is often implicit. Consider:

(63) *Mia-nun* pothong/yekan *pappu-n* *kes-i ani-i-ya*
Mia-TOP commonly busy-COMP-NOM not-be-DEC
(*emchengna-key pappu-a.*)
extraordinarily busy
'Mia is not COMMONLY busy; she is extraordinarily busy.'

The stressed *pothong* 'commonly,' but not the unstressed one, functions as an NPI, taking the focal NOM marker, but not the CT marker, before the negation of external nature. These facts also support my view of the information structure basis of PA/SN and DN/MN distinctions. The most common source of NPIs is IND + CNC. Another is adverbial NPIs by CF – MN as in (63) or CT negation as in *not particularly*.

4 Concessivity and scalarity by CT-*nun* and concessive-*to* in polarity

4.1 Where does scalarity come from?

In (64), *han saram* 'one person' is indefinite, nonspecific and not a partition (=IND 1) and when it occurs with the Contrastive Topic (CT) marker *-nun*, as a quantifier DP, invokes a scalar implicature of denial of a stronger value, looking upward, in the scale. The assertion part of the utterance is concessively accepted in the sense that it is followed by a concessive conjunction (*haciman* 'but'), being paraphrasable to a concessive adverbial construction led by *-e-to* 'although.' Observe:

(64) *han saram-**un*** *o-l swu iss-ta.*
one person-CT come-can-DEC
'One person-CT (≒ Up to one person) can come.'
+> '*But* not more than one person can come.'
≒ '*Although* one person can come (*han saram-un o-l swu iss-**e-to***), not more than one person can come.'

However, a numeral plus CT marker does not directly constitute an NPI, although it generates a denial implicature. On the other hand, when the Concessive marker (CNC) *-to* (in Korean)/ *-mo* (in Japanese) is attached to an indefinite such as a numeral/minimizer and INDefinite-*wh-*/ *amu-* (and *any* with implicit *even* Lee & Horn 1994) (Lee 1993, 1996), it generates an NPI, as shown in the contrast between (65) and (66). Therefore, without negation, it creates anomaly cross linguistically.

(65) a. *han saram-**to*** *an w-ass-ta.*
one person-CNC not come-PAST-DEC

b. hitori 'one person' -mo CNC ko-nakatta 'not came' [Japanese]
(a, b) 'Not even one person came.'

(66) a. **han saram-**to*** *w-ass-ta*
one person-CNC come-PAST-DEC

b. *hitori-**mo** kita. [Japanese]

c. ***ek bhii admii** *aayaa.* [Hindi]
one even man came
(a, b, c) '*Even one person came.' (cf. Not even one person came.)

d. ***teen admii bhii aaye**.
'Even three men came.' (bad in the 'even' meaning)

If it is followed by a NOM, as in (67), however, it must be either specific or a partition, though not definite necessarily, taking wide scope over the negation as an existential, in the S. So, 'more than one person didn't come' is not scalarly entailed by (67).

(67) a. *han saram-i* *an w-ass-ta*
one person-NOM not come-PAST-DEC (NOM=Nominative)

b. *hitori (-ga)* *ko-nakatta.* [Japanese]
one person-NOM come-didn't
(a, b) 'One person didn't come.'

In view of these facts, attributing polarity simply to focus, as done by Rooth (1985), Krifka (1995) and partly Lahiri (1998) or to its relatedness to scalar implicature suspension, as proposed by Chierchia (2004), is all important but is not adequate enough explanatorily. Chierchia's approach is interesting but simply lacks the ultimate motivation behind polarity. Concession with an indefinite compositionally triggers an adversity scale, requiring a close flat wide scope negation (as in *even one*; with negation *none* < *not one* <*not even one*) to become an NPI, and the resulting NPI DP and its systematically related affirmative CT-marked DP in (69) may constitute duals, as argued early for the definite DP-associated pair in You & Lee (1996) and rediscovered partly and independently by Oshima (2002). In other words, (68) below is equivalent to the external negation of (65):

(68) *han saram-**to*** *an o-n kes-un* *ani-i-ta.*
one person-CNC not come-REL CMP-CT not-COP-DEC
'It is not the case that not even one person came.' = 'One person-CT came.'

(69) *han saram-**un*** *w-ass-ta.*
one person-CT come-PAST-DEC
'One person$_{\mathrm{CT}}$ came.' (≒ *Up to one person came.)[4]

The possible duality relation and the relative positions of those Concessive DPs and CTs in the Square of Opposition will be discussed shortly. Generally, DPs in (65) and (67) are focal, whereas that in (64) and (69) is topical; the CNC marker in (65) is focal and the DP in (67) as the subject of a thetic sentence is rather focal and out of the scope of the predicate negation. The NOM-marked DP, therefore, can be regarded as a Positive Polarity Item (PPI), like some uses of *some* in English (see Szabolcsi 2004).

Rooth's focus alternatives are not scalar and his simple extension to an English morpheme *even* for likelihood implicatures lacks a general explanation. The motivation of scalar alternatives lies in the strategy of making concession. Concession is scalar: a bigger concession entails a smaller concession. The speaker concedes to the hearer, as if it were a game of interaction. When you make concession you go down the scale of alternative adverse steps. So, the weakest bound in a given situation must be negatively rendered. Thus the total negation of the maximization of the relevant *wh*-domain is possible if the bound is the lowest like *one* or *hana* 'one' in any language. The emphatic concessive adversity reaches maximization reversely in polarity. (65) has the original assertion part (70), as in Lahiri (1998) and its corresponding likelihood hierarchy implicature part to be discussed:

(70) $\neg\exists x[\mathbf{one}(x) \wedge \mathrm{person}(x) \wedge x \text{ came}]$ (assuming that **one** is true of any entity that contains at least one atomic part) 'No one came.'

[4]In English, the scalar expression *up to* can occur only in modal contexts, not in episodic ones, whereas the CT marker *-nun* in Korean, though with a similar meaning, can occur in episodic contexts, although it functions as a weak NPI-licensing context.

Lahiri and many others assume that the above scopal way of representing (65) is good enough to show its entailing all the negative larger numbers than **one** (and furthermore its implicating that the larger numbers' not coming is more or equally likely, as hinted from its translation into English). However, this is not so obvious. To be explicit about the entailment and implicature involved, there must be a CNC and therefore scalar unit of concept or operator (*even*, *-to*, or *-mo*) before the weakest quantificational value (*one* here) to make the relations work properly.

4.2 Any indefinite lower bound with concessive creates negative polarity

The process of conflict itself to explain the unacceptability of (66) with 'one' was well captured in Lahiri (1998), except full scalarity and its ultimate motivation. Lack of concessivity and full scalarity in Rooth and Lahiri, however, leads to the failure of distinguishing between (contrastive) focus and concession. Focus induces simple alternatives and simple alternatives to 'three' instead of 'one' include not only numbers larger than 'three' but also numbers smaller than 'three,' whereas concession requires 'three' with a Concessive as the lowest possible bound in the quantitative scale as expected in the discourse context, denying propositions with larger numbers scalarly. To meet this need, we need the following likelihood scalarity definition:

(71) For every cardinality natural numeral predicate U, U′ such that
$\forall x[\mathbf{U}(x) \rightarrow \mathrm{U}'(x)]$,
likelihood ($^\wedge\neg\exists x[\mathbf{U}(x) \wedge$ person$(x) \wedge x$ came$]$)
$>$likelihood ($^\wedge\neg\exists x[\mathbf{U}'(x) \wedge$ person$(x) \wedge x$ came$]$)
(If a numeral U is larger than U′, then the coming of U′ is more likely than that of U and U′'s not coming is less likely than U's not coming.)
[The implicature part is fully scalarly defined here, unlike Lahiri's]

Positive scalarity is reversed to negative scalarity fully in (71). Lahiri's approach may cause difficulty treating a case of NPI with a non-lowest bound in a scale such as (72a, b), and (9a, b):

(72) a. *sey saram-to* *an* *w-ass-ta.*
three person-CNC not come-PAST-DEC

b. *SAN NIn-MO* *KO-nakat-ta.* [Japanese]
three person-CNC come-NEG-PAST
(a, b) 'Not even three persons came.' ($\approx$ 'Less than three came.').

(73) a. *Mary-nun* *sey muncey-**to*** **(mot) phul-ess-e.*
Mary-TOP three problem-CONCESS not solve-PAST-DEC

b. *Mary-wa* *mondai-o* *mitsu-**mo*** *deki-na-katta.* [Japanese]
Mary-TOP problem-ACC three-CNC solve-not-PAST
(a, b) Mary could ?*(not) **even** solve three problems.
$+>$ 'Mary could solve less than three problems.'

(73a) involves concessivity down to a lower bound 'three problems' or any number *n* because of the Concessive marker/morpheme. But the lower bound has to do with the CT meaning of minimum expectation *sey muncey-**nun** phul-ess-e-ya hay* '(She) should have solved (at least) three problems.' This way, a Concessive and a CT are closely intertwined. The CT fall-rise or *-nun*-marked clauses in (74), invoking a scalar implicature connected by a connective of concessive

nature, can be paraphrased into concessive clauses in (75). CT is also based on concessivity. (76) shows how scalarity works with the lowest natural number 'one' and the CT marker in Korean (and Japanese). One person or event with its individuation cannot, but mass can, have partitions. The CT marker in (76b) can not be scalar; no lower affirmative is possible. The former with *-nun* cannot occur with negation but the latter can, as in (76b) and (77). Consider:

(74) a. Mary solved [three problems – L+H*LH%].

b. *Mary-ka sey muncey-**nun** phul-ess-e* [*mondai-o mitsu-**wa**.* Japanese]
Mary-NOM 3 problem-CT solve-PAST-DEC
+> '***But*** Mary solved not more than three problems.'

(75) a. Although/*Even* if Mary solved three problems, she didn't solve more than three problems.

b. Mary-ka sey muncey-**nun** phul-ess-***ciman*** (-e-*to*), te-nun mot phul-ess-e

(76) a. *han saram-**un** o-l swu iss-ta.* [(64) repeated]
one person-CT come-can
'One person can come.' (Up to one person - - -)
+> '***But*** more than one person can not come.'

b. ?**han saram-**un** **an** w-ass-ta.*
one person-CT not come-PAST-DEC
?*'╲One╱ person didn't come.' (Up to one person - - -)

c. ?**han pen-**un** **an** w-ass-ta.* Cf. *han pen-**to** **an** w-ass-ta. 'He never came.'*
one time-CT not come in-PAST-DEC
'(He/she) didn't come up to one time.'

(77) a. *Whisky-rul han pyeng-**un** **an** masi-ess-e.*
whisky-ACC one bottle-CT not drink-PAST-DEC
'(I) didn't drink one bottle of whisky-CT.' (- - - up to one whole bottle)

4.3 A weak NPI and covert concessive for scalar implicature suspension

A weak NPI is formed by Common Noun + *n* Classifier + ***-i-ra-to*** 'be-DEC-CNC' (*n* = *numeral*) and is licensed by weakly negative contexts for a 'settle-for-less' strategy (Kadmon & Landman 1993). One such example 'one person' ***-i-ra-to*** can occur in a predicate CT, as in (78). A weak NPI but not a CT or strong NPI can occur in a monotone-decreasing context like a conditional, as in (79). Observe:

(78) *han saram-**i-ra-to** o-ki-**nun** hay-ss-e/o-ass-e.*
one person-be-DEC-CNC come-NMZ-CT do-PAST-DEC
'At least one person did come (but *denial of a higher predicate*/*proposition*).'

(79) *twu saram*-**i-ra-to** / **twu saram*-***un*** / **twu saram*-***to***
two person be-DEC-CNC / two person-CT / two person-CNC
o-***myen***, *sicakha-kess-ta*.
come-COND start-will-DEC
'If two persons-***i-ra-to*** (weak NPI) come, I will start.'

The 'two persons' part in the weak NPI 'two persons'-***i-ra-to*** in the conditional of (79) can be replaced by the weakest predicates such as *nwukwu* 'INDwho' and *amu* 'any person,' other quantifiers such as 'some' and 'half' and scalar predicates in a broad sense such as 'lift a finger,' 'budge an inch' and 'touch,' 'push,' 'hurt' - - -, to form a weak NPI. They all have the semantic or rank scale notion and the resulting weak NPIs show a minimum satisfaction point in the 'begging' or 'settle-for-less' concession strategy. Korean has two separate slightly different Concessive forms (with *-to* in common) for strong and weak NPIs (in Greek as well) but English and some other languages do not have separate forms. English NPI *any* and Concessive *even* occur in both contexts, weak and strong. In English NPI *any*, *even* is covert (Lee & Horn 1994). Let us consider the English counterpart of (79a) and examples of weak quantifying determiners without *even*. With *even*, denial of *more than n* is impossible (80b). Without *even*, still the implicature of *not more than n* is suspended in the monotone-decreasing context of conditional (81a), but it can stay, as in (81b), depending on the context, unlike in (80b). A weak NPI is also triggered by a negative implicature of *glad* in (82), which causes difficulty for the nonveridicality licensing condition, as pointed out in Lee (1999c). Horn (1989) indicates that the computation of scalar implicatures appears to be inhibited not only by negation but also generally in 'negation like' monotone-decreasing contexts such as *doubt*. Chierchia (2004) further points out that any *any*-licensing contexts can suspend implicatures, with (83). The modifier position of the universal quantifier in (83) is anti-additive and a weak quantificational connective *or* is in the scope of a covert *even* (as in *even* [A *or* B]) to form covert a weak NPI. Then, naturally a stronger [A *and* B] is accepted, suspending the exclusion scalar implicature. Observe:

(80) a. If even two persons come, I will start. (If more than two come, that's better.)
b. *If even two persons come, I will start, but if three persons come, I won't.

(81) a. If two persons come, I will start. (If more than two come, that's better.)
b. If two persons come, I will start, but if three persons come, I won't.
c. If anyone/a half/one third comes, I will start. (If more than more than one/a half/one third comes, that's better.)

(82) a. I am glad that I (*even*) got two tickets.
b. I am glad that I got *any* humble tickets./I (*even*) got humble tickets.
c. *I even got two tickets. [D. Jewitt p.c.]

(83) Everyone who takes a test or presents a paper will pass.
Expectation: A student who does both will pass. [Suspension of 'not both']

There are various contexts that license such weak NPIs: a weakly monotone-decreasing contexts (Chierchia 2004) as well as a nonveridical (Zwarts 1995) or even more weakly negative contexts including CT and weakly negative predicates, as argued in Joe & Lee (2002), Lee (2004). In those

contexts of weak NPI licensing, the suspension of scalar implicatures denying a stronger/higher value in the scale is extremely naturally expected since a stronger/higher value (=negation of the denial of it) is most welcome from the beginning, making concession by setting the low minimum sufficiency point, in a gesture of 'begging' (Lee 1999c) or 'settle-for-less' (Kadmon & Landman 1993). So far this possibility of general application of covert Concessive marking has not been explored. This is the ultimate motivation of why scalar implicature suspension contexts generally coincide with all sorts of weakly negative contexts. This was a big puzzle for Chierchia (2004).

Even *any* in English functions as a weak NPI with the covert *even* in a weak licensing context like a question. It has to do with the weakest quality/property/kind, rather than quantity. That is why it is odd to answer an *any* question with a cardinal. Consider:

(84) A: Did you eat *any* apples?
B: Yes, I even ate rotten/#three apples.

The affective expression '*any* apples' in the question corresponds to the weak NPI '*amu* sakwa-*i-ra-to*' in Korean.

In the case of strong quantifiers, which cannot get a weak NPI marker *-i-ra-to* '(settle-for-less) even,' we can conceive the situation as one in which the denial (negation) of a stronger value is cancelled by the 'negative' force of monotone-decreasing or non-veridical contexts. We can see this in weak NPI contexts such as:

(85) a. If most students come in, I will start the class. ('*not all*' suspended)
b. Did most students come in? (Yes, all of them.)

(86) I am glad you got most tickets.
Yes, (actually) I got all of them.

Uncertainty contexts such as conditional (85a), question (85b) and emotive factive predicate (86) are contexts that license weak existential *any* and its equivalent in various languages. I pointed out that a CT context is an additional suspension context, although it may not license *any*. But its corresponding CT sentence licenses an existential weak NPI in Korean. Any contexts that are non-veridical, in its extended sense, suspend scalar implicatures, if not exhaustivized by Focus.

5 Implicature suspension; CT and concessive on square of opposition

5.1 Implicature suspension affected by topicality and focality

The information structure notions of (Contrastive) Topic and (Contrastive) Focus greatly affect the suspension of scalar implicatures. Chierchia (2004), however, does not incorporate these. In a (contrastive) topical context, the denial of a stronger value *not both*/*not and* in *or* is suspended and the *both* reading is predominently favored as to be regarded as the only reading in the Topic-marked DPs in the Topic position crosslinguistically (Korean and Vietnamese). Topic typically requires strong (definite, universal, *both*) DPs and opts for the strong reading. In this respect, this seems to be different from suspension in monotone decreasing contexts. Consider:

(87) a. As for linguists or philosophers, they are stubborn. <suspended: both>

b. Linguists or philosophers are stubborn. <not suspended: ¬both for many and suspended for some native speakers> Lee (2004)

(88) a. As for the oranges or the bananas, they are next to the door. <suspended: both>

b. The oranges or the bananas are next to the door. <not suspended: ¬both>

c. As for the oranges, Mary likes *(them). - - - Topic

(89) ??Oranges or bananas, Mary carried.

(90) *As for *any* linguists, they are stubborn.

As in (87) and (88), *or* in the *as for* construction is interpreted as *both A and B*, and *or* in the subject position without *as for* keeps the up-denial scalar implicature, regardless whether the predicates involved are individual-level (though suspended for some people) or stage-level ones. Topicalization of a disjunctive DP from non-subject, as in (90), is bad; a conflict arises because the topicality effect of a strong reading is needed without *as for*.

On the other hand, Sevi (2005) objected to Chierchia's generalization that all the contexts that license *any* suspend scalar implicatures, saying that he is wrong because almost all the contexts Chierchia listed as suspending scalar implicatures (*not both* of *or*) actually license them. Such contexts are negation, negative DET (*no*), restriction of *every*, antecedents of conditionals, negative embedding predicates such as *doubt*/*regret*/*fear*, generic statements, *before*, *without*, comparatives, verbs of comparison (*prefer*), modality of permission, questions and imperatives. All the examples Sevi gives are answers to the previous *wh*-questions that have wide scope over other possible scope-bearers or quantifiers (see also Groenendijk & Stokhof 1984). Then, the relevant answer part will have narrow Focus. Consider:

(91) a. Whom didn't Sue meet?

b. She didn't meet Hugo or Theo (I don't know which). (Sevi 2005)

Such utterances or echo questions with *wh*-words in situ may occur. Indeed Sevi assumes a *wh*-question in situ to get a focused cardinal to solve Chierchia's exceptional example – *If John has* $[\textit{two}]_{\mathrm{F}}$ *cars, the third one parked outside must be someone else's*. The embedded question one can postulate would rather be an alternative question 'Does he have two or three cars?' to derive the CF $[\textit{two}]_{\mathrm{CF}}$ cardinal.

5.2 Predicates weaker than monotone-decreasing suspend implicatures

Hoeksema & Klein (1995) failed to identify the following special type of predicates weaker than monotone-decreasing that suspend implicatures. Consider:

(92) a. Students *turned off* beepers **or** cell phones. <*not both* suspended>

b. *Mary *turned off* <u>any</u> lamps in the building.

c. Students *turned on* beepers or cell phones.<not suspended; *not both*>

(93) a. *mathit-es e-kli-san ta radiophone **i** kinita tous.* <suspended> [Greek]
'Students turned off their radios or mobile phones.'

b. **mathit-es e-kli-san tipota kinita.*
'Students turned off *any* mobile phones.'

c. *mathit-es anik-san ta radiophone i kinita tous.* <not suspended>
'Students turned on their radios or mobile phones.' (E. Christodoulou p.c.)

This double nature of not licensing *any* and suspending implicatures comes from the duality of the event structure of the predicate *i.e.*, the subevent of agentive process, which is positive, and the subevent of absence result state changed from process to *off* as opposed to *on*, which is negative. A complex event analysis by the Generative Lexicon Theory à la Pustejovsky (1995) can capture this nicely, not a single event analysis by the (Neo-) Davidsonian approach. But these weakly negative predicates cannot suspend implicatures of quantifiers such as *some*.

As indicated, a Concessive and a CT marker are closely intertwined and we can even find an NPI formed by the latter, being attached to an aspect or event reiteration adverbs *tasi* 'again' or *ni-do* (Japanese) 'two times.' To save a weaker affirmative presupposition, 'a second time' or a number larger than 'one' is employed. Consider:

(94) a. *ku-nun tasi-**nun** o-ci anh-ass-ta/*w-ass-ta.*
he-TOP again-CT come-CI not-PAST-DEC/*came
'He did not come ever again.' (Presupposition: he came at least once before).

b. *ni-do-to-**wa** shi-mai / *suru.* [Japanese]
two-time-TO-CT do-won't / do
'(I) won't do it twice.' (Presupposition: I did it once.)

There was not an alternative situation in which he came back (a) or there won't be an alternative situation in which I will do it for the second time (b). The agents involved have a bad feeling about what they already did and it is put in sharp contrast with a new situation. This kind of effect cannot be attained by their combination with the Concessive *-to* or *-mo*.

In (95), a total (=universal) and a partial (=existential) predicates (Yoon 1996) appear in an alternative Q and the answer can be (95a) with a total predicate in CT but not with a partial predicate in CT, as in (95b). NEG > Total Pred is a CT but not NEG > Partial Pred. A parallel is the case with the CT contour in English, as in the translations. Consider:

(95) *cuk-ess-ni sal-ass-ni.*
die-PAST-Q live-PAST-Q
'Is (it) dead or alive?'

a. *cuk-ci-**nun** anh-ass-e.* [cuk- 'dead': total predicate]
die-CI-CT not-PAST-DEC
'(It) is not DEAD_{CT}.'

b. ?**sal-ci-nun anh-ass-e.* [sal- 'alive': partial predicate]
live-CI-CT neg-PAST-DEC
'(It) is not ALIVE_{CT}.' %(But the fish is still fresh.)

A CT-marked inherently negative adjective utterance conveys some associated positive thing and conversely its antonymous positive adjective conveys a negative stronger predicate for a certain goal. Consider:

(96) a. *kil-i* *cop-ki-NUN* *hae.*
road-NOM narrow-NM-CT do-DEC
'The road is narrow CT.'

b. 'But two cars can go through.'

(97) a. *kil-i nelp 'wide'-ki-NUN hae.*
'The road is wide-CT.'

b. 'But not enough for trucks to go through.'

CT both in English and Korean serves as a context that licenses a weak NPI as well. CT is based on scalar structure for concessive admission and polarity reversal in conveyance of meaning. Negative polarity is also based on concession and concession generates scales (Lee 1999b). It is not limited to Determiners, DPs, and adverbs. Strong negative polarity predicates such as *lift a finger* are scalar with the covert CNC *even* and can occur with contrastive contour to become a weak NPI, generating a contrastive negative proposition. Observe:

(98) He lifted a ╲finger╱ (to help her). [L+H*LH%] (from Lee 2000)
+> But he wasn't active enough to be very helpful.

The predicate *lift a finger* is the lowest bound in the concession scale. Exactly the same kind of scalar C-set is employed showing a degree of bigger motions for being substantially helpful to someone. Going down to a lower bound adversely is making concession. Admission contexts such as CT, conditional, rhetorical question (101), etc. license weak NPIs (of 'begging' or 'settle-for-less' type), denying a stronger alternative. Strongly negative contexts such as overt negation and *before* clause license strong NPIs (99–100), negating the lowest element. Observe strong and weak NPI cases.

(99) Sam didn't (even) lift a finger.

(100) Before Sam (even) lifted a finger, everything had been finished.

(101) Would he (even) lift a finger?

CT is concessive admission of the uttered part and the speaker's intent is to convey the polarity reversed scalar implicatures denying a stronger/higher element. The crucial principle is denial of a stronger value in the relevant scale and its consequence is: if the uttered part is affirmative, then its implicature is a negative proposition denying a stronger/higher value; if the uttered part is negative, its implicature is an affirmative proposition with a weaker affirmative value in the scale evoked in the context.

The intervention effect, a problem for everybody (Chierchia 2004), is basically a matter of focality (and topicality) competition (Lee 2003c) rather than of pure LF nature, with the class of **quantized** quantifiers including cardinals as interveners. Chierchia's attempt to include *if* in the class does not seem to be intuitively plausible.

5.3 Are the CT marker and the concessive marker duals?

Returning to the possible duality relation between the CT marker *-nun* and the CNC marker *-to* and their positions in the Square of Opposition, let us consider how (68) becomes equivalent to (69) and it appears they come into duality. The DP *han saram -to* 'even one person,' as [IND + Concessive], along with *amu-to* 'even anyone'/*nwukwu-to* 'even INDwho,' *sey saram -to* 'even three person' and *celpan-to* 'even a half,' is an NPI and forms a negative sentence with the negative *ani* (contracted to *an*), as in (65). These weakest [IND + Concessive] forms and other IND quantifiers including arbitrary cardinal numerals like 'three,' with CNC, require the negative *ani*, being considered to take the E corner. The weakest [IND + CNC] forms plus negation all roughly mean 'none' and is equivalent to *motwu* 'all (persons)' + *ka* NOM with negation (all> not). This universal negation form is also at E. If (65) is negated, as in (68), it becomes (69). Therefore, we are tempted to say that the DP or Q(uantifier) *han saram-to* 'even one person' or [IND + *-to*] in general and *han saram -un* 'at least one person/one person$_{\mathrm{CT}}$' or [IND + *-nun*] in general, respectively, are in duality. Let's try with *nwukwu-to* 'even IND*who*.' As an NPI, it must get the negative *ani*, taking E. Then, its negation (102) is equivalent to *nwukwu-i-nka-**nun*** 'somebody$_{\mathrm{CT}}$', which takes the I corner.

(102) *nwukwu-**to*** *an o-n kes-***un** *ani-i-ta.*
IND*who*-CNC not come-PAST/REL COMP-CT not-be-DEC
'It is not the case that nobody came.'

(103) *motwu-ka* *an o-n kes-***un** *ani-i-ta.*
all-NOM not come-PAST/REL COMP-CT not-be-DEC
'It is not the case that every body didn't came.'

(104) *nwukwu-i-nka-**nun*** *w-ass-ta.*
somebody-CT come-PAST-DEC
'Somebody$_{\mathrm{CT}}$ came.'

The positive existential expression *nwukwu-i-nka-**nun*** 'somebody$_{\mathrm{CT}}$' in (104) at I is in contradiction with the negative NPI expression *nwukwu-to* 'even IND*who*' *ani* 'not' in (102) at E. In (102), the CT operator has as its domain the entire preceding clause ($[_{IP}\ldots]_{CT}$) and gets focally associated with the NPI Q (=Quantifier, DP) to change it to an existential Q in a CNC-CT flip-flop in shape by interaction in Korean. When the NPI Q *nwukwu-to* 'even IND*who*' occurs with the inner negative *an* before the predicate 'come,' it first gains universal force (with negation wide scope) but within the scope of the outer CT-marked negation (I will call this 'CT negation'), the CT-associated NPI Q (although *-nun* cannot be attached to *-to*) must change to its corresponding existential Q with double negation effect. Therefore, we can say that the CNC *-to* and the CT marker *-nun* function as duals at least asymmetrically when we apply an outer CT negation to a CNC NPI negative sentence. The same operation occurs when the equivalent universal negation Q replaces the NPI Q, as in (103). Therefore, both (102) and (103) are equal to (104). However, a CT-negation as the only negation in a sentence with such an NPI cannot be associated with it. It can only be associated with other constituents in the sentence, with the verb 'come' in (105). This kind of existential Q-based NPIs show an interesting clear contrast with universal Qs in CT-negation sentences (106) and (107). In (107), the CT can be associated with the universal Q subject (or alternatively with 'come'), making it a narrow scope-bearer over negation and making

the consequent become equivalent to (107b), where a direct combination of 'all' and CT occurs. (106) and (107b) must be located at the O corner. Observe:

(105) amu-to *o-ci-**nun*** *anh-ass-ta.*
any-CNC come-CI-CT not.DO-PAST-DEC
'Nobody came$_{CT}$.' (But some sent gifts.)

(106) ALL ＼didn't come／. (L+)H*LH%∼> ∀
Cf. ALL didn't come＼. H*LL% ∀ >∼

(107) a. *motwu-ka an o-ci-**nun*** *anh-ass-ta.*
all-NOM come-CI-CT not.DO-PAST-DEC
'It is not the case that all didn't come.' Or 'All came (but - - -).'

b. *motwu-**nun*** *o-ci* *anh-ass-ta.*
all-CT come-CI not.DO-PAST-DEC = (103)

The operations involved in CT negation as scope determiner above occur underlyingly in English as well in parallel.

Let's consider the Square again and see the Q and negation relations. The positive universal expression *motwu-ka* 'all-NOM' at A entails existential expressions at I and the negative Qs at E entail their corresponding negative expressions at O. The universal Q at A is in contradiction with the negative universal Q *motwu-nun ani* 'not all' at O, which in turn implicates the positive existential Q *nwukwu-i-nka-**nun*** 'somebody$_{CT}$' at I. We can establish the traditional duality between A and I Qs by way of A = ∼I. . . ∼. Observe:

(108) a. *nwukwu-i-n-ka-**nun*** *an o-n kes-i* *ani-i-ta.*
IND*who*-CNC not come-PAST.REL CMP-NOM not-be-DEC
'It is not the case that somebody didn't come.'

b. *motwu-ka* *w-ass-ta.*
all-NOM come-PAST-DEC
'All came.'

In (108a,b), the Q of I *nwukwu-**nun*** as a whole and that of A *motwu-ka* as a whole are duals. We can also apply the internal and external negations to the latter and arrive at (103), which is equivalent to (102).

We can also apply CT negation to (72), where the subject [cardinal + CNC] Q *sey saram-to* 'even three persons' occurs as NPI already with negation, as (109). The CT marker, which is topical and focal, gets associated with the focused Q *sey saram-to*, followed by negation. (109), then, seems to entail (110). Observe:

(109) [*sey saram-to* *an* *o-n kes*]-***un*** *ani-i-ta.*
three person-CNC not come-PAST.REL COMP-CT not-be-DEC
'It is not the case that not even three persons came.'

(110) *sey saram-**un*** *o-ass-ta.*
three person-CT come-PAST-DEC
'Three persons$_{CT}$ came.'

However, (109) can further denote alternative situations in which more than three (four or five - - - with the effect of 'at least three') persons came. Then, we may have to say that entailments denying a higher value 'more than three' invoked by the NPI negation in (110) can be negated by the CT in this particular case. If the subject 'three persons' is relaced by a middle Q *celpan* 'half,' entailment from (109) to (110) is rather solid. Furthermore, it is not easy to see how negating (110) twice leads to a positive counterpart of (109) *'***sey saram-to** *o-ass-ta*' or *'***celpan-to** *o-ass-ta*' with '*celpan* 'half' instead of *sey saram-to*. This ungrammaticality happens because IND + CNC is an NPI form. The equivalent positive forms of *-to* are *-ina* 'as many as' (upward looking, as opposed to *-to*, which is downward looking because of concessivity) in Korean and the same form of *-mo* but with a high tone in Japanese. If the Qs are replaced by a definite nominal + *to* such as *Mia-to*, *-to* normally becomes an additive and does not fuction as an NPI formative. But a negative sentence with it can be CT-negated to entail the corresponding positive sentence *Mia-nun w-ass-ta* 'Mia$_{CT}$ came.' Negating this twice is easier to entail its affirmative counterpart *Mia-to w-ass-ta* and their duality in this case appears clearer.

The asymmetry of duality test and other opposition relations is more visible in numeral and other midscale Qs than those Qs at the four extreme corners of the Square (see Horn 1989 for 'arithmetic scale' and Levinson 2000 for the problem of midscale expressions). That seems why van Benthem (1984) said only the four corner Qs A "all", E "no," I "some," and O "not all" are the ones that obey general conditions such as Conservativity, Quantity and so on. But lexicalization of 'no' at E and no lexicalization at O are rather a language particular phenomenon caused by typology and historical developments, as hinted by Hoeksema (1999), but the E corner lexicalization seems to be based on the general tendency of IND + CNC becoming frozen into NPIs. Indeed English, German and few other languages have prenominal negative elements which result from a combination of a negative and a weak Q or a weakest numeral. In an SOV language like Korean or Japanese, negation occurs necessarily preverbally or postverbally and NPIs can occur in the subject position, anti-c-commanding the licensor. Even the I corner Q 'some' in English is a rare case; the majority of languages form existential Q from IND*wh*-words or even interrogative sentences as in Korean and Japanese, e.g., *nwukwu-i-nka* 'Who is (it)?' in (104). This indefinite PPI as a nominal can occur freely with case markers and all other markers but even if it is combined with *-to*, it cannot function as an NPI. Observe:

(111)	*nwukwu-i-nka-**to***	(*an*) *w-ass-ta.*	cf.	*nwukwu-**to***	*(*an*) *w-ass-ta.*
	[who-be-Qn]-ADD	not come-PAST-DEC		IND*who*-CNC	not came
	[Qn = Question marker; ADD = Additive]				

Consider all the relations so far discussed in the following Square of Opposition:

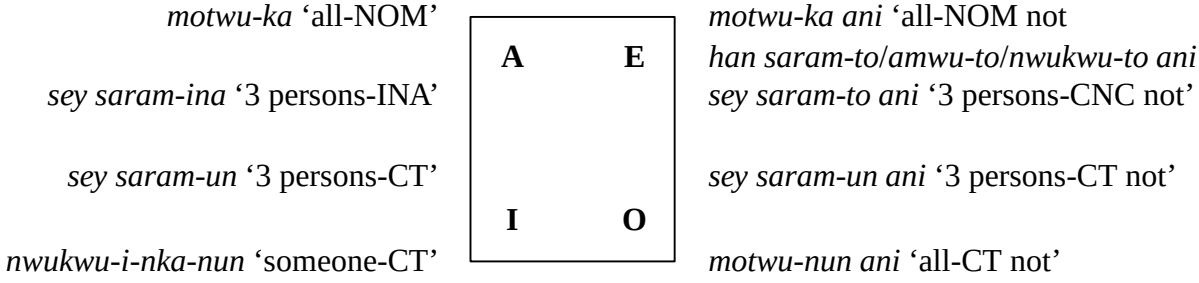

Figure 2: Quantifiers in Square of Opposition in Korean

We can now see that various Qs in Korean characteristically show the CT and CNC markers in a rather compositional or at least decompositional way whereas English and other related languages rarely do. The upper dimension corners (A, E) nest Qs that are typically focal, whereas the lower dimension corners (I, O) nest Qs that are typically contrastively topical. The Qs of the weakest or weak indefinites at E end in the Concessive marker to show their lower-bound concession gesture but to acertain strongly negative contexts (or weakly negative contexts in the case of the weaker 'begging' or 'settle-for-less' Concessive marker *-i-ra-to* attached to the same INDs or even Definites) for emphatic denial with the following negative (or settle-for-less in a polarity-sensitive) context. In English, 'not (even) one/anyone/three/a half' or a lexicalized 'none' ($<$ not one $<$ not even one) or 'no' can be at E, together with its dual 'all ... not' ($\sim$I = A ... $\sim$ [duals]). The weak(est) INDs such as *one*, *any*; *three*, *a half* must have the Concessive *even*, equivalent to *-to*, covertly or overtly to be preceded by a negative. The weakest must take the E corner. All the weak quantifiers following *not* must be interpreted with *even* in front of the quantifiers, even if it is not overt. On the other hand, the strongest Q like *all*, if preceded by *not* in English must be interpreted as a CT Q. Here again, a CT fall-rise L+H*LH% intonation (╲*all*╱) may be covert or overt in English but its effect on interpretation is clear. This meaning complexity of partial admission and partial denial because of CT seems to block the lexicalization of 'not all' and possibly any other 'not + strong Q' as expected from the Monotonicity Correspondance Universal (proposed by Barwise & Cooper 1981) differently from 'no,' 'none,' and 'never' (n-words with negative force), which are negatively emphatic and straightforward, like scalar NPIs in other languages. The positive Q *all*, if it occurs with CT, cannot find an upper value for denial because *all* is highest and becomes ill-formed. Observe:

(112) a. ?*╲All╱ came.

b. ?**motwu-**__**nun**__ *w-ass-e.*
all-CT came
'At least all came.'

Therefore, universal Q with CT must occur with negation to invoke a lower affirmative scalar implicature. Thus, the O corner *motwu-nun ani* or *not all* necessarily gets a CT interpretation. The I corner Qs corresponding to 'some' such as *ilpu-nun* 'a part', *nwukwu-i-nka-nun* implicate but not entail this *not all* at O and the latter also implicate the former in a pragmatic relation.

5.4 The exhaustive *-man* 'only' is scalar as well as logical but unlike *-nun* (CT) and *-to* 'even'

Unlike *-nun* the CT marker and *-to* 'even' so far treated, *-man* 'only' may be logical in the sense that the denial of relevant alternatives is entailed in it. It is different from *only* in English in the sense that it typically has the agent's intentional or controllability meaning. Various scalar meanings denoted by *only* in English are put in different expressions in Korean and Japanese. *Only* in English is interpreted in its exhaustivity as well as in its scalarity in the predicate and elsewhere. On the other hand, *-man* in Korean is interpreted often in its exhaustivity and in its scalarity in quantificational (including numeral and predicate) contexts. This is largely the case in Japanese, although there are some interesting differences between Korean and Japanese (Harada & Noguchi 1992). In English, *only* in (113a) is scalar but its counterparts in Korean are not *-man* 'only' but some other expressions. Consider:

(113) a. I *only* talked to a secretary. [scalar or logical (ambiguous)]

b. *pise-hako* pakk-ey *yayki-ha-ci* mot *hay-ss-ta* [not - except] [scalar]
secretary-with except talk-do-CI not did

c. pise-hako-*man* yayki-hay-ss-ta [exclusion] [logical]

(114) a. I only jumped 1.90m. [scalar]

b. na-nun 1.90m *pakk-ey mot* ttwi-ess-ta [high or long jump (or running)] [scalar]

c. na-nun 1.90m -*man* ttwi-ess-ta [running situation, not high or long jump, exclusion interpretation]

(115) a. I am only a secretary. [scalar]

b. *na-nun pise-i*-l ppwun/ttarum-*i-ta*
I-TOP secretary-be-PreN-PPWUN-be-DEC

c. *na-nun pise-*man*-i-ta

The Korean counterpart of the scalar reading of (113a) is (113b). In (113b), an exception phrase *pakkey* 'except' has been employed together with an ability modality negation marker *mot* 'not able to,' denoting unfavorable circumstances. (113c), with -*man*, can only denote exhaustivity. A parallel relation of scalarity holds between (114a) and (114b). (114c), with its exhaustivity/exclusion interpretation and intentional meaning, can only be used in a running situation felicitously because we can hardly adjust a high or long jump. With an identificational predicate nominal, as in (115), *only* in English is scalar and its equivalent in Korean is another morpheme, not -*man*.

However, -*man* in Korean is also applied to a lower element in inherent scales of numerals, quantifiers and predicates, not to a highest or higher element, as in (116), (117) and (118):

(116) a. *Yumi-nun sakwa-rul sey kay-man mek-ess-ta.*
Yumi-TOP apple-ACC three CL-only eat-PAST-DEC
'Yumi only ate three apples.'

b. **Yumi-nun sakwa-rul yel kay-man mek-ess-ta.*
Yumi-TOP apple-ACC ten CL-only eat-PAST-DEC
'Yumi only ate ten apples.' [when the total is ten] (*pakkey* may be better to show dissatisfaction)

(117) *Yumi-nun Inho-rul mil-ki-man hay-ss-ta.*
Yumi-TOP Inho-ACC push-NMN-only do-PAST-DEC
'Yumi only pushed Inho.' [not a higher predicate such as 'hurt.']

Some quantificational operator head *ONLY* may be posited so that its agreement association with its marker and its scopal behaviour (118) may be explained (Lee 2005b) and for blocking implicatures (Sauerland 2004) in my Contrastive Focus (or Horn's metalinguistic negation) situation (119). But scalar meanings involved in *only* are semantically/pragmatically important.

(118) a. *Sue-man(-un) motu-ka cohaha-n-ta.* (In the underlying order, ($\forall >$ only))
Sue-only-TOP all-NOM like-PRES-DEC
(i) 'All like only Sue.' ($\forall >$ only) (ii) 'Sue is the only all like.' (only $> \forall$)

b. *Sue-man-ul motu-ka cohaha-n-ta.*
Sue-only-ACC all-NOM like-PRES-DEC
'All like only Sue.' ($\forall >$ only) [not ambiguous]

(119) a. They did not play MANY of Beethoven's symphonies. They played ALL of them.

b. They did not play **only** MANY of Beethoven's symphonies. They played ALL of them.

c. *They did not play only MANY of Beethoven's symphonies. They played a few of them.

d. *Dia bukan memutuskan dengan hanya tiga lelaki, tetapi empat/*dua.*
she not cut.ties with only 3 guys but 4/*2

(Indonesian, Rosidin p.c.)
'She dumped not only three guys but four of them/*two of them.'

As we have seen, CF pairs are mediated by metalinguistic negation. If ***only*** occurs with quantificational expressions such as numerals, quantifiers and scalar predicates in its scope, it necessarily gets a scalar interpretation under the scope of negation to block the denial of stronger alternatives but not all alternatives including denial of weaker alternatives. Therefore, Sauerland's (2004) postulation of *ONLY* under negation for a metalinguistic negation cannot account for cases like (119c), where a correction alternative is offered in the second conjunct. If we want to incorporate such positive alternatives into a broader range of metalinguistic negation, we must consider postulating a Contrastive Focus (CF) operator under negation so that only the metalinguistically negated expression is picked up and all the denials of relevant alternatives can be negated and any relevant affirmative alternative can occur in the second conjunct. In Indonesian (119d), - - - *dumped not hanya 'only' 3 tetapi 'but' 4* is all right but - - - *tetapi 'but' 2* is ungrammatical, which exactly shows that *hanya 'only'* is only scalar here and *tetapi 'but'* functions as SN here.

Only and *-man* Qs are converted from *all* and *motun* Qs, as in *Only men* [G] *are snorers* [F] from *All snorers* [F] *are men* [G] and can be positioned behind A as A′ in the square, further forming E′, I′ and O′ in the three dimensional space (Horn 1997). By considering *Only non*-G *is* F, which has the internal negation of the first argument/predicate, we can also establish duality of *-man* and *-to*. It is equivalent to *No* G *is* F, which is an NPI version, and O′ = *Not only* G *is* F is a CT negation. The system is a parallel with A, E, I, O and we do not elaborate it.

There are two different negation wide scope contexts - - - CT and CF in all languages; if negation scopes over CT, scalar and denotational, if it scopes over CF, metalinguistic. This has been a big puzzle in Linguistics so far![5]

[5]Hans Kamp, in p.c. (2004), complained that metalinguistic negation also has wide scope over its target quantifier, just as in descriptive negation over a universal quantifier, etc.

6 Conclusion

So far we have examined the roles and effects of information structure and concessivity on polarity-related implicature generation and suspension in discourse. This paper has investigated the systematic relatedness between the concessive *-to* (or *mo*)-marked polarity phenomenon and the high tone *-nun* (or *wa*)-marked Contrastive Topic phenomenon with respect to underlying concessivity and thereby derived scalarity. We have explored the correlations between (overt and covert) Contrastive Topic and PA conjunction (*-ciman*) on one hand and between Contrastive Focus and SN conjunction (*-ka ani-i-ra*) on the other to show the linkage between information structure and argumentation structure of Q- and R-implicatures cross-linguistically. CT is denotational and CF – SN is metalinguistic but can parasitically be denotational. Negation wide scope itself is not a panacea; if over CT – partial negation and if over CF – metalinguistic negation. The intervention effect is also a problem of focality-topicality. The exhaustivity focus marker *-man* (or *dake* in Japanese) is more logical than *only*. Its scalar but intentional and not concessive features have also been observed in inherently scalar numeral, quantifier and predicate contexts.

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IMPLICATING AND FOCUSING ON LEXICALLY UNDERSPECIFIED INFORMATION

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1 Introduction

The Spanish lexicon abounds with items that encode Motion through a bounded Path but that lack information about the way in which that Path is traversed; this is a pattern of lexical encoding that is characteristic of Spanish but that is not colloquial in English (see Talmy 1985, 2000) as illustrated in sentence (1).

(1) *El niño entró a su habitación.*
the child entered to his bedroom
'The child walked into his room.'

The English translation makes apparent the different strategies for describing Motion in the two languages. The main verb in English encodes the way in which the Path was traversed – which I will call Means of Motion; in this specific case, it denotes a motor pattern involving, roughly, raising one foot, moving it forward while keeping the other foot on the ground iteratively.[1] In contrast, the main verb in Spanish denotes a bounded Path that is traversed in an unspecified way. Yet another major difference is that the English main verb doesn't encode a bounded Path (in fact, it has been argued that it doesn't include a Path at all (cf. Talmy 1985; Goldberg 1995; Rappaport-Hovav & Levin 2001),).[2] The central thesis proposed in this paper is that Spanish speakers uttering sentence (1) do not assert information about Means of Motion but they certainly imply it; more precisely, the utterance of (1) implies the proposition expressed in (2).

(2) *El niño caminó.*
the child walked
'The child walked.'

[1]Talmy (1985, 2000) would use Manner of Motion instead Means of Motion; I use the latter as a subtype of the former such that Means of Motion denotes only information about a (sub)event that is in the same causal path as the event denoted by the sentence. This distinction will become clear later in the paper.

[2]Sentence (1) could be also translated as 'the child entered his room', however, this translation does not represent colloquial English but rather reflects a Latinate usage restricted to some contexts.

Means of Motion in Spanish is not said but it is communicated by a pragmatic inference that I call 'Means Expanditure'. 'Means Expanditures' or MEs are (Generalized) Conversational Implicatures that strengthen the information carried by sentences with underspecified verbal entries. MEs are drawn essentially from Grice's second maxim of Quantity Q2 (Grice 1975) – or a version of it, such as Horn's R-maxim (Horn 1984, 2004) or Levinson's I-principle (Levinson 1987, 2000) – and shared background knowledge about the default behavior of entities in relation to a particular eventuality.

The information about Means of Motion cannot be implied in every circumstance. There are cases where the Actor moves in a way that is not typical for the Path being traversed; in this case, Means of Motion can be explicitly expressed in Spanish by embedding a gerund phrase (GP) into the main clause; the information conveyed by GP cancels out the Means Expanditure as illustrated in sentence (3).

(3) *El jefe entró a su oficina corriendo.*
the boss entered to his office running
'The boss ran into his office.'

This sentence is an instance of the type Complement of the Spanish Gerund Construction (SGC_C); in particular, it represents the subtype Means of SGC_C ($SGC_{C\text{-MEANS}}$), which owes its name to the Means relation that connects the main event e_M denoted by the main clause and the event e_G denoted by the gerund phrase. In consonance with the strong tie imposed by Means, the syntactic bond between the main clause and the gerund phrase is tighter than expected in comparison with other non-subcategorized constituents such as adverbial clauses; in particular, GP behaves as a constituent in the local domain of the main verb in spite of not being lexically required (hence, the label 'Complement')[3]. As any internal modifier, GP stands out as the constituent introducing the salient information of the utterance. I will show that GP bears the Focus feature of SGC_C sentences and, further, that this feature is allowed to project to the constituent that contains GP; hence, GP bears the Focus feature in 'presentational' information structures (Zubizarreta 1998).

The Focus status of GP is particularly relevant because it is consistent with the 'implicature' analysis of the proposition in (2). Speakers are prevented from making Means explicit in default cases since the overt expression of Means – expressed by GP – attracts Focus. After showing that Means has to be expressed by GP, I raise the question about the possible derivation of this relation from general interface patterns; namely, is it possible to derive that necessary association from a general Focus-Means correlation or, rather, from a Means-syntactic properties of GP correlation? I argue that only the first alternative is valid across different constructions and, hence, should be preferred.

Section 2 defines the notion of Means and shows that it is not lexically encoded. Section 3 describes how Means is typically pragmatically communicated. Section 4 analyzes the interface properties of the construction that express Means explicitly and, finally, Section 5 discusses alternative analyses.

[3] 'Complement' is used in the sense of HPSG; namely, any phrase that needs to be listed in the COMP list can be called Complement and, certainly, this is the case with GP (París & Koenig 2003).

2 The semantics of Means

Means as used in this paper is an event relation exemplified by sentence (3). It is a macro-event constituting relation; that is, sentence (3) denotes a single complex event – 'enter running' – constituted by mereologically related events. Specifically, Means imposes the mereological relation 'event overlap' on the main event e_M (i.e. 'entering') and the gerund event e_G (i.e. running).[4]

(4) $e_M \otimes e_M$

In formal terms, 'event overlap' entails that there is a third event e_Z that is (a non-necessarily proper) part of both e_G and e_M.

(5) $\forall e_M, e_G \in U_C[e_M \otimes_C e_G \leftrightarrow \exists e_Z \in U_C[e_Z \leq_C e_M \wedge e_Z \leq_C e_G]]$
(adapted from Krifka 1998)

This formal definition entails a partial identity relation between (non-necessarily proper) parts of e_M and e_G. Events are complex structures. Does sharing any part of that internal structure amount to a mereological relation? The definition in (5) states that not any part will do but only a part that is itself an event. This constraint suffices to characterize the overlap relation extensionally; we may still wonder, however, if it is possible to characterize intensionally the properties that induce speakers to categorize a relation between two events as overlap. For example, we may ask which entities and properties associated with the event descriptions $\delta(e_M)$ and $\delta(e_M)$ – that derive from the lexical entries *entrar* 'enter' and *correr* 'run', respectively – need to be shared in order for a relation to be event overlap. They are listed in (6) (see also París 2003a; París & Koenig 2003).

(6)
1. The two events share participants (e.g. in (1), the Actor or Figure and the Path).
2. These participants are shared in relation to overlapping spatio-temporal segments.
3. There is a relation between those participants that is also shared; in particular, a relation that is part of the causal path that constitutes the events (e.g. in (1) the Motion relation).
4. 'Proportionality': being in the same causal path and sharing time intervals, the two events have an interdependent unfolding in the sense that the progress in the unfolding of e_G necessarily conveys the progress in the unfolding of e_M.[5]

The Means relation is not exhausted by event overlap. Means involves an intrinsic asymmetry – Means $(e_M, e_G) \neq$ Means (e_G, e_M) – that can't derive from event overlap, which is itself

[4]Mereological relations are necessary to capture the meaning of sentences like (1). They contain two event descriptions of different events; then, the question is what the relation between those two events is and the best way to capture it is mereologically, namely, 'event overlap'. An alternative analysis is not to be preferred since it would assume that the two event descriptions in (3) denote the same event and this position presupposes a highly arguable notion of event identity, which, further, makes the question about the relation between the internal structures of those events irrelevant (See París 2003a for further discussion).

[5]This constraint could be related to 'incrementality' (Dowty 1991) in so far as the progression in the Path measures out the unfolding of the events.

symmetric (i.e. $e_M \otimes e_G \rightarrow e_G \otimes e_M$). It is this asymmetry that prevents speakers from expressing a Means relation with a reverse mapping to syntactic structure such that, for example, the running event cannot be encoded in the main clause nor the entering event can be encoded in GP as attested in sentence (7).

(7) *#El niño corrió entrando a la habitación.*[6]
the child ran entering to the room
'The child ran into the room.' (intended meaning)

I have shown elsewhere (París 2003a,b; París & Koenig 2003) that the asymmetry of the Means relation arises from a constraint that demands one event description to be more specific than the other in relation to the shared event. In sentence (1) the running event description $\delta(e_G)$ is more informative than the entering event description $\delta(e_M)$ in relation to the description of the shared subevent e_Z since $\delta(e_G)$ contains all the entailments associated with $\delta(e_M)$ – namely, a Figure participant in Motion – but, in addition, $\delta(e_G)$ entails a motor pattern for the Figure in Motion. The asymmetry intrinsic to Means is captured in (8) below.[7]

(8) Semantic asymmetry: the gerund event description $\delta(e_G)$ needs to be more specific than the main event description $\delta(e_M)$ in relation to e_Z (the shared subevent).

This asymmetry condition suits the asymmetry in the distribution of information intrinsic to a large subset of the Spanish lexicon. Verbal lexical entries contribute representations of eventualities that are highly underspecified in relation to the initial part of the event (i.e. Means) denoted by the sentence that contains them. The verb *entrar* 'enter' in sentence (1) describes a Motion event in which a Figure entity (i.e. the professor) moves along a bounded Path to a Goal, which is required to be a kind of enclosed space (i.e. the classroom). The set of entailments – or postulates – contributed by the verb includes roughly the following ones:

(9) a. The entering event e_M contains two subeventualities as subparts, e_B and e_C, at intervals t_B and t_C such that $t_B < t_C$.
b. In event e_B, a Figure/Theme moves along a Path.
c. The change of state e_C has s as a final state in which the Figure is located.
d. The end of the Path is (some kind of) an enclosure.

The uneven distribution of information is apparent. The initial part of the event is not as specifically described as the final part because there are more entailments associated with the latter. In particular, entailments (9c) and (9d) describe the final part of the entering event by specifying that it contains a change of state whose final state involves the Figure located in some kind of Goal (i.e. an enclosure). In contrast, the only statement targeting the initial subevent states the presence of a moving Figure but there is no specification whatsoever about the properties of this Motion. Representations in different traditions of the decompositional semantic analysis have captured this asymmetry; for example, the Conceptual Structure in (10) corresponds to the verb 'enter' in Jackendoff (1990).

[6]Sentence (7) is odd under the Means interpretation; however, it can be acceptable under a temporal interpretation. For example, it can be a felicitous answer to a 'when' question (*¿Cuándo corrió*? 'When did he run?'); it can't be an answer to a 'how' question (*¿Cómo corrió*? 'How did he run'?).

[7]The fact that $\delta(e_G)$ includes $\delta(e_M)$ in relation to e_Z can be challenged by saying that $\delta(e_M)$ is telic whereas $\delta(e_G)$ is not. However, the telicity in $\delta(e_M)$ does not translate into telicity for $\delta(e_G)$ (París 2000).

(10) $[_{Event}\text{GO}([_{Thing}], [_{Path}\text{TO}([_{Place}\text{IN}([_{Thing}])])])]$

Translocational Motion is introduced by the primitive function 'GO', which only involves a Path introduced by the Path function 'TO'; crucially, the end of this Path is expressed by the function 'IN' as an enclosure whereas no function is associated with the description of the initial part of the Path. Similarly, in the tradition of the aspectual calculus (Dowty 1979), Van Valin & LaPolla (1997) assigns the Logical Structure (LS) in (11) to 'enter'.

(11) $[\textbf{do'}(x, \varnothing)\text{BECOME}(\textbf{be-at'}(y, x)]$

This LS contains a generic activity predicate (i.e. **do'**) and a change of state (i.e. BECOME) that includes a locative final state (i.e. **be-at'**). This representation also captures the fact that the final part of the entering event is more thoroughly specified than the initial part.

The asymmetry does not only pertain to bounded Motion, but it also extends to causative Motion verbs, causative change of state verbs and, more broadly, to a large subset of telic verbs. For example, the Logical Structure associated with the causative-motion verb *tirar* 'throw' in (12a) encodes an Actor that performs an unspecified activity causing an entity – i.e. Figure – to move through a bounded Path. The causing event is not specified whereas the final change of state is, as reflected in the Logical Structure (12a) and/or the Conceptual Structure representation in (12b).

(12) a. $\textbf{do'}(x, \varnothing)\text{CAUSE}[\text{BECOME}\textbf{be-at'}(z, y)]$

b. $[_{Event}\text{CAUSE}([_{Thing}x], \text{GO}([_{Thing}y], [_{Path}\text{TO}(z)]$

Causative change of state verbs like *matar* 'kill' in (13) also reflects the same information asymmetry; namely, the initial part of the event is represented as a unspecified part of the event whereas the result is a specific change of state.

(13) a. $\textbf{do'}(x, \varnothing)\text{CAUSE}[\text{BECOME}\textbf{dead'}(y)]$

b. $[_{Event}\text{CAUSE}([_{Thing}x], \text{BE}([_{Thing}y], [_{Path}\text{AT}(dead)]$

Spanish offers an option to counterbalance the lexical bias to leave Means information unspecified; the intrinsic asymmetry of these lexical entries is alleviated by the introduction of the gerund event description $\delta(e_G)$ associated with GP in $\text{SGC}_{\text{C-MEANS}}$. In sentence (3), the running event description $\delta(e_G)$ describes an event e_G that is identified with the initial part of the entering event e_M; the information contributed by $\delta(e_G)$ fills in the underspecified information in $\delta(e_M)$. In example (14), the main event e_M involves two subeventualities; namely, it contains an unspecified causing eventuality e_B and a change of state e_C as an effect. The gerund event e_G overlaps with e_B, the causing eventuality of e_M; that is, the jumping-over-the-fence event is the causing eventuality that changes the (mental) state of the public.

(14) *El potro sorprendió al público saltando el corral.*
the stallion surprised to-the public jumping-over the corral
'The stallion surprised the spectators by jumping over the fence.'

The kind of relation encoded in $\text{SGC}_{\text{C-MEANS}}$ is routinely called 'Manner' rather than Means (e.g. Talmy 1985, 2000). However, I reserve the category Manner to label a supertype that includes event relations like Means but also Circumstance as illustrated by sentence (15), an instance of $\text{SGC}_{\text{C-CIRC}}$.

(15) *El niño llegó a casa cantando una canción.*
the child came to home singing a song
'The child came home singing a song.'

Circumstance relates two events that are in different causal paths but share participants in relation to the same spatio-temporal segment. The coming event e_M and the singing event e_G share the Actor (i.e. the child) in relation to the same time interval and space. In contrast to the constraint imposed by Means, the unfolding of the singing event does not entail progress in the unfolding of the coming event; e_M and e_G are in different causal paths in Circumstance. Despite these differences, there are semantic and structural reasons to maintain both relations under the same type. In short, there is linguistic evidence showing that Circumstance denotes a single macro-event (i.e. 'come home singing' event) out of two event descriptions and this macro-event is mapped to the same syntactic structure than Means (namely, the GP in $\text{SGC}_{\text{C-CIRC}}$ is also tightly dependent on the main clause).

There is a second and perhaps more pervasive strategy to communicate Means information in Spanish; it consists of leaving Means implicit in cases where the event takes place in the expected way. This is the strategy that is analyzed in the next section.

3 The Pragmatics of Means

The previous section exposed the underspecification in relation to Means of a large set of verbal lexical entries as well as the semantics of the Spanish construction that remedies it (i.e. $\text{SGC}_{\text{C-MEANS}}$). Being absent in the lexical entry, Means in Spanish cannot be asserted in sentences headed by those verbs unless a gerund phrase provides this information. Means of Motion is not part of the assertion made by uttering sentence (1) – repeated below – which contains *entrar* 'enter' as its single predicate.

(1) *El niño entró a su habitación.*
the child entered to his bedroom
'The child entered his room.'

The claim I support in this paper is that Spanish has another strategy than the explicit one in $\text{SGC}_{\text{C-MEANS}}$ to fill in lexically underspecified information. Even if Means is not 'said' in (1), it is nevertheless communicated such that the speaker who utters (1) also conveys the proposition in (2), which contains the information about the initial part – i.e. Means 'proper' – of the event entering event.[8]

(2) *El niño caminó.*
the child walked
'The child walked.'

[8]The specification 'proper' that qualifies Means is intended to disambiguate two senses of the category Means as I use it here. The primary sense is Means as a relation between two events and their respective descriptions; the second one or Means 'proper' designates the information that corresponds to the second argument of the Means relation; namely, the event description that carries the information about the initial subevent of the macro-event.

I call this inference Means Expanditure (ME). Expanditures are inferences that strengthen lexically underspecified information with propositions that are drawn from shared knowledge and conversational principles. ME contributes information about the initial subevent of the event denoted by a sentence. This initial subevent, which in the case of *entrar* in (1) involves the Motion of an entity along a Path, is specified by the walking implicature in (2). It is important to notice that the subevent described by ME was already denoted by the event description associated with the main verb (i.e. *entrar*), although not described. That is, we may say that sentence (1) denotes an entering event that contains a subevent – the initial subevent e_B introduced by a variable in the lexical entry of *entrar* – involving the Motion of an entity. We can either say that the Means implicature introduces an event e_G of which e_B is a (non-necessarily proper) part; in this sense, ME does not introduce a new event.[9] In either case, ME does not introduce an entirely new entity.

In particular, ME is drawn from 'implicit premises' that express background knowledge coming from different sources. Despite ranging over different domains, these different kinds of knowledge share the property of being equally represented with defaults. In the case of Motion, the background knowledge is about the default way in which entities move in relation to a particular kind of Path as listed in (16).[10]

(16) a. Walking is the default human locomotion for the kind of Paths denoted in (1) (the Path into a classroom).

b. The professor is human.

c. The explicit information in sentence (1) is also a premise; namely, the professor is a Figure moving along a bounded Path.

Strictly speaking, only premises (16a) and (16b) are background knowledge and, hence, are assumed by the speaker to be part of the common ground; (16c) is the explicit information carried by the uttered sentence. These premises *per se* do not constrain the hearer to draw the Means Expanditure. There are many elaborative inferences (possibly an infinite number) that can be drawn on default knowledge; for example, we can infer 'the teacher was dressed' from 'the teacher entered the room' since this is the way professors typically go into classrooms. But the Means Expanditure in (2) is not just another inference that can be drawn in the process of interpretation. ME follows from the following conversational maxims and is thus attributable to the speaker's intended meaning.

(17) a. The second maxim of quantity (Q2), or the R-principle in Horn's account (Horn 1984) or the I-principle in Levinson (1987, 2000), 'don't say more than it is necessary'.

b. What Levinson's call the Enrichment Rule (Levinson 2000:114), a corollary of principle 'I' that states 'amplify the informational content of your utterance by finding the more specific interpretation up to what you judge is the speaker's intended m-point'.

[9]The choice between those two options seems largely to depend on different theories of events. Roughly, the first alternative would be consistent with a Davidsonean view (where multiple event descriptions can be associated with the same event); the second option is consistent with a Kimean view where different properties identify necessarily different events. I have favored the second alternative but argued that, in fact, 'e_B = e_G' due to a 'Metonymic Convention on Reference' which determines that an expression strictly denoting an event part can denote the whole if the relation between the part and the whole is Means (París 2004).

[10]Default reasoning is understood here as characterized, for example, in Bach (1994:38) where it means 'inference to the first unchallenged alternative', which is typically the one that is based on prototypical information.

The extent to which the speaker's intention can be accessed is rather a controversial matter (among others, cf. Levinson 2000, Horn 2004); it is, however, a central criterion in the Gricean program that helps to distinguish as interpretative inferences from implicatures, the latter being information attributable to the speaker's message. I can offer here three pieces of evidence – to be further elaborated later on – indicating that (2) is indeed part of the speaker's intention. First, ME describes the initial part of the entering event and, hence, it is already denoted in (1); it was argued earlier than the Motion of a Figure is a necessary event part that leads to the change of location intrinsic to the entering event. Second, humans – and objects in general – move along Paths in specific ways (e.g. run, swim, walk, drive, etc.) but this information is not specified by the sentence. Therefore, there is an event part that is denoted but not described and there is a general tendency to fill in underspecified information with defaults (Levinson 2000). These two facts provide a speaker enough ground as to predict that hearers are likely to draw MEs and, hence, she needs to regulate the encoding of her message accordingly. There is yet a third motivation; the explicit expression of Means leads – for reasons to be explored in the next section – to infelicitous sentences as illustrated in (18) below.

(18) *?El niño entró a su habitación caminando.*
the child entered to his bedroom walking
'The child walked into his bedroom.'

The overt expression of default Means is infelicitous; speakers are thus prevented from expressing it in such circumstances. The absence of explicit information cannot be taken an indication that the speaker didn't intend to communicate it. I conclude, hence, that it is correct to assume that ME is part of the speaker's intention rather than a mere 'default' inference.

As expected (Horn 1984), the entailment and the implicature relations proceed in opposite directions. Namely, there is a unilateral entailment relation such that the stronger statement – the one that contains Means – entails the weaker one – the less specific one. Sentence (18) entails sentence (1), repeated here in (19).

(19) *El niño entró a su habitación caminando.* ⊢ *El niño entró a su habitación.*
the child entered to his bedroom walking — the child entered to his bedroom
'The child walked into his bedroom.' — 'The child walked into his bedroom.'

In contrast, the weaker assertion in (1) R-implicates the stronger one (18). The Means implicature follows from Minimization or, as Horn (1984) puts it, 'say the less to mean the more'. The speaker has the choice to pick two expressions. Since (1) is shorter and (syntactically) simpler than the other, uttering (18) would convey the implication that the way the event was performed was somehow unexpected or unusual and, hence, it would only be felicitous in restricted contexts.[11]

The proposition about the prototypical way of performing an action by a specific entity is a necessary premise of ME. This knowledge may not be 'linguistic'; that is, it is unlikely that 'walking' – or any Motion pattern for this sake – is part of the meaning of the noun 'child'. In addition, the properties of the Path are relevant to strengthen the implicature. In sentence (1) the typical Path that leads people to a bedroom has some length measurable in steps; walking is the

[11]For example, a context where it is unexpected for the Figure (i.e. the children) to walk since speaker and hearer know that she has had knee surgery two hours before the walking event.

typical way of traversing this kind of Path for humans. Certainly, a different kind of Path could cancel out the expanditure as illustrated in sentence (20).

(20) *Las tropas entraron a la ciudad al amanecer.*
the troops entered to the city to-the dawn
'The troops went into city at dawn.'

The Path leading to a city has a length that is not typically walked by humans nowadays. In addition the Figure is a collective entity that typically requires vehicles for Motion. This enforces the cancellation of 'walking' as an implicature from (21). Further, if the figure is not associated with a default motion other than walking, the combination with the Path in (20) becomes odd out of context.

(21) *?El niño entró a la ciudad.*
the child entered to the city
'The child entered the city.'

There is a clash between the typical Means of Motion of the Figure (i.e. walking) in relation to traversing that particular Path. The length of this Path is not associated with walking, hence, the speaker needs to be aware of this background knowledge.

The Means expanditure is not dependent on a specific lexical item but on a specific content. Hence, it is non-detachable in the sense that every expression conveying content similar to the one in (1) implicates the same Means.

(22) *El niño se metió a su habitación.*
the child REF put-into to his bedroom
'The child walked into his bedroom.'

Sentence (22) also implicates 'walking' as a Means of Motion given that the Figure is human and the verb *meterse* 'put-yourself-into' entails Motion and a bounded Path that ends in an enclosure of some sort. It does not encode information about the way this Path is followed by the Figure.

MEs are Generalized Conversational Implicatures (GCIs) rather than Particularized Conversational Implicatures (PCIs) (see Levinson 2000). The decisive factor in determining if an implicature is a PCI is its dependence on a specific context. The range of data that ultimately support this view are scattered over the paper. That is, there is no specific identifiable property that is shared by every context in which the expanditure is drawn and that, hence, could be thought of as triggering it. In contrast, specific contexts may rather cancel the inference. Being an implicature and based on default reasoning, MEs need to be 'defeasible'. In particular, the background knowledge associated with human locomotion can be overidden by more specific knowledge. For example, the soccer aficionado knows that players usually run into the field; hence, more specific knowledge cancels out the stereotypical assumptions that played a role in analyzing (1), as illustrated by sentence (23).

(23) *Los jugadores entraron a la cancha entusiasmados.*
the players entered to the field excited
'The players were excited when they got onto the field.'

Furthermore, a particular conversational context could make the hearer hold her judgment about ME. Sentence (1) could be an answer to the question 'Where is my child?' uttered by a mother in search of her son. Sentence (1) explicitly encodes the information requested; the information carried by ME becomes less relevant and, hence, might simply not be drawn (rather than cancelled).

In addition to inferring the specific type of Motion of an entity in a particular Path, MEs can also be inferred in relation to the kind of entity that causes Motion in another entity. For example, the initial part of the Spanish causative motion verb *tirar* 'throw' is highly underspecified. The vagueness of *tirar* 'throw' is asymmetric as is captured decompositionally by the representations in (6a) and (6b) above. These representations make apparent that the causing (sub)eventuality associated with the action of the Agent as well as the type of Motion of the Figure/Theme are not specified. However, by uttering sentence (24) a speaker also communicates the information in (25) and (26), which specifies the causing eventuality and the Motion of the Figure.

(24) *El niño está tirando piedras al río.*
the child is throwing stones to-the river
'The child is throwing stones into the river.'

(25) The child is using his hands.

(26) The trajectory of the stones is ballistic.

The meaning of the verb – an Agent applies a force to an entity causing it to move to a goal – is enriched with MEs based on the fact that humans typically use their hands to apply a force to the kind of entities in (24) in order to move them through the Path denoted by 'to a river'. Also, the trajectory of the Figure is inferred to be horizontal (furthermore, it is 'ballistic'). The verb does not specify Means of Motion but it is necessarily true of (24) that the child used some propelling device to cause the movement which, given the kind of affected entity, is likely her hands (rather than an instrument or another part of the body).

Sentence (27) contains the verb *tirar* associated with the same meaning but different expanditures.

(27) *El avión tiró las cinco bombas en la ciudad.*
the airplane dropped the five bombs in the city
'The airplane dropped the five bombs in the city.'

The Agent is – by a metonymic relation – a person in control of the airplane, which is the Instrument used to cause the Motion of the Figure (i.e. the release of the bombs) to the city. It is assumed that every Spanish speaker's background knowledge contains information about how airplanes are used in relation to bombs that are supposed to target cities. Given this background information and the conversational maxim in (17), by uttering (27) the speaker also communicates the following information.

(28) a. The airplane was flying above the city.
b. The bombs' trajectory was vertical and downward (as opposed to ballistic)

Sentence (29) shows yet other MEs associated with sentences containing the verb *tirar* and its core meaning captured above.

(29) *Tenga cuidado que está tirando té por todo el piso.*
be-IMP careful that is throwing tea over all the floor
'Watch out because you are spilling tea all over the floor.'

In this use, the relevant expanditures determine that the liquid moved downwards in a vertical motion after the Agent moved the container she was holding. Spanish speakers do not need to be more explicit because the information carried by sentence (29) – a human causing a drinkable liquid to move to the floor – typically refers to an involuntary action and, as such, the motion is not 'ballistic' but downwards.

The interpretation of sentence (39) is instead specific about the Agent's body part involved in the propelling of the Figure. The expanditure is that a foot was used since the event is a soccer match and hearer and speaker know how soccer is played (and presumably Beckham's function on a team).

(30) *Beckham le tiró la pelota para que la cabeceara.*
Beckham DAT threw the ball so that ACC head-SUBJ
'Beckham kicked him the ball so that he could head it.'

The verb *tirar* can also be associated with a Means Expanditure that specifies an instrument as in (31); since the interlocutors are talking about tennis and they know who Agassi is, the speaker does not need to specify the instrument nor the type of Motion of the ball.

(31) *Agassi tiró la pelota a las líneas todo el partido.*
Agassi threw the ball to the lines all the game
'Agassi hit the ball on the line during the entire match.'

A further specification that can be attributed to MEs is not only about the body part used to cause Motion but also its position. In sentence (32) the Agent is holding the Figure in one of her hands and moving it in an underhanded forward way.

(32) *Tiráme las llaves por favor.*
throw the keys by favor
'Toss me the keys, please.'

The enumeration of senses of *tirar* that are typically determined by Means Expanditures is definitively larger; for example, *tirar* has senses akin to the English 'shooting', 'knocking down', 'knocking over' that are also derived with MEs.[12] The regrettably brief description above is, however, sufficient to make clear that *tirar* is associated with a single abstract meaning that is vague – rather than ambiguous – that is specified through Means Expanditures. The verb is vague in relation to the information expressed in (33).

(33) a. The Agent's body part involved in the event. For example, it could involve hands (in different positions as in (24) and (32) or feet as in (30).

b. Any instrument used by the Agent (as in 31).

[12]The verb *tirar* is also ambiguous; in addition to the meaning being addressed here – i.e. caused motion – it has several others that are, however; irrelevant for us.

c. Different orientations of the movement: ballistic (e.g. sentence (24)); downward movement (e.g. sentence (27) and (29)).

Causative change of state verbs may also favor ME. It is shown in (34) that the lexical representation of 'kill' is uneven in that its two subevents are asymmetrically described such that the causing eventuality is underspecified whereas the effect contains specific information about the final state.

(34) $[\textbf{do'}(x, \varnothing)]\text{CAUSE}[\text{BECOME}\textbf{dead'}(y)]$ from Dowty (1979:91)

There is an activity (i.e. represented by the semantic primitive **do'**), but it is highly underspecified. Under these conditions, we would predict that MEs are likely to be drawn from sentences headed by these types of causative verbs as in sentence (35).

(35) *El cazador mató un león.*
'The hunter killed a lion'

Given the semantic information represented in (34) and the background knowledge regarding the prototypical behavior of hunters in relation to the killing of lions, sentence (35) really means (36) given the R-implicated 'shooting'.

(36) The hunter killed the lion by shooting it.

A speaker who utters (35) describing an event where the hunter bumped into the deer while driving is clearly misleading the addressee. That is, given the rational conventions of language use, the speaker should know that she can leave the causing event underspecified if it took place in a default way.

4 Focus Structure

In the previous section I have detailed the conditions that allow Means to be communicated through an inferential process that strengthens underspecified lexical entries. Here I will focus instead on analyzing the interface properties underlying $\text{SGC}_{\text{C-MEANS}}$, the construction that allows the explicit expression of Means information. The basic characteristic to bear in mind is that Means cannot be expressed if it can be pragmatically inferred (through a Means Expanditure); namely, Means can't be said if the event occurred in the expected way as illustrated in (37).

(37) *#El niño entró a su habitación caminando.*
the child entered to his bedroom walking
'The child walked into his bedroom.'

The overt expression of Means is only felicitous if the Means Expanditure is cancelled out as in sentence (38), an instance of $\text{SGC}_{\text{C-MEANS}}$.

(38) *El niño entró a su habitación corriendo.*
the child entered to his bedroom running
'The child ran into his bedroom.'

$SGC_{C\text{-}MEANS}$ conceals a number of asymmetries that pertain to different grammatical components and I will show that they are in fact systematically correlated. At the center of the correlations is the basic asymmetry represented by the uneven distribution of information in the main verb's lexical entry. As discussed earlier, telic verbs like *entrar* 'enter' describe the final part of the denoted event more fully than the initial part, which was captured earlier in terms of number of entailments. Let's say then that the final subevent is 'lexically foregrounded', a term that is taken from Talmy (2000) but which points out here to the presence of more information about the final subevent than about the initial subevent. The final subevent is, hence, more visible than the initial subevent, which is in turn 'lexically backgrounded'. The organization of the lexicon as a system of oppositions (in the traditional structural sense) further emphasizes this asymmetry since the information about the final subevent distinguishes *entrar* 'enter' from other verbs of the same class (i.e. *salir* 'exit'). I have argued elsewhere (París 2003a) that this foregrounding by opposition is the effect of an organizational principle of the lexicon that I dubbed 'paradigm principle' (París 2003a; similar notions have been also proposed in among others, Clark 1993; Koenig et al. 2003).

This lexical asymmetry is the mirror image of the information structure asymmetry intrinsic to SGC_C and which I intend to characterize here. There is a certain 'prominence' of GP in opposition to the other constituents in sentences (3) or (38) uttered with unmarked intonation. This prominence is, initially, prosodic since the gerund bears the sentential primary stress but it is also informational in the sense that the information carried out by the GPs in (3) and (38) stands out in comparison to the content of the other constituents. These two kinds of prominence are captured by assuming that GP bears the Focus feature in SGC_C in sentences with 'presentational' – as opposed to 'contrastive' – Focus structure; namely, sentences where the Focus feature on GP can project to the entire VP/S. Certainly, the Focus feature can be borne by other constituents than GP; each context – typically modeled as a question – demands specific information and the constituent that satisfies this demand is marked as Focus. But even if virtually any major constituent can be Focus in SGC_C, the choice of a constituent other than GP requires a change in the unmarked intonation pattern and, crucially, a contrastive Focus interpretation. Sentences (39) and (40) are felicitous only in contexts where the constituent *a la habitación* is narrow Focus. Neither of these sentences can be an answer to 'What happened?' questions, namely that they can't represent a presentational Focus structure.

(39) *El niño entró a la* HABITACIÓN *corriendo.*
the child entered to the bedroom running
'The child entered the bedroom running.'

(40) *El niño entró corriendo a la* HABITACIÓN.
the child entered running to the bedroom
'The child entered the bedroom running.'

The change in the unmarked intonation pattern carries a change in the interpretation of the sentences; this change can be derived from a general rule that correlates Focus and sentential stress (cf. Focus Prosody Correspondence Principle, Zubizarreta 1998:38).[13] That is, the assignment

[13]The correlation Focus-pitch accent is not absolute; there are constructions – e.g. wh-questions – where this association does not hold (see, for example, Lambrecht & Michaelis 1998). We still can think of it as a default association, which might be overridden in the case of a particular construction.

of pitch accent to different constituents in, on the one hand, sentences (39) and (40) and, on the other hand, sentence (3) marks a different Focus assignment and, hence, a different interpretation (i.e. different contrastive sets, Rooth 1996). In addition, the fact that sentences (39) and (40) cannot be associated with a presentational Focus structure indicates that the Focus feature cannot range over VP/S if it is borne by a constituent other than the GP in SGC_C.

Further evidence of the prominence of GP in comparison to other constituents in the sentence comes from the interpretation of Focus sensitive operators. The scope of operators such as 'negation' (e.g. (41)) and 'event quantifiers' (e.g. (42)) – and hence, their truth conditions – is determined by the selection of Focus.

(41) *Juan no entró a su oficina gateando.*
Juan not entered to his office crawling
'Juan did not crawl into his office.'

(42) *Juan siempre entra a su oficina gateando.*
Juan always enters to his office crawling
'Juan always crawls into his office.'

The salient interpretation of sentence (41) is that only the entering event took place whereas the crawling event is negated; that is, being a Focus sensitive operator, the negative adverb only has scope over GP. The assertion in sentence (42) includes every entering event, whereas it does not necessarily include every crawling event; in terms of a tripartite structure interpretation of quantifiers, the quantifier has universal force on the presupposition but not on the Focus – i.e. GP (Chierchia 1992).

The unmarked intonation in Spanish sets the pitch accent in postverbal position, more precisely the Nuclear Stress Rule predicts that stress should come in the rightmost-peripheral constituent (Chomsky & Halle 1968; Cinque 1993) or, in a different formulation, the 'lowest' constituent in a c-command relation (Zubizarreta 1998). Given that the unmarked position of GP – as illustrated in (3) and (38) – is the rightmost phrasal node, it is predicted that GP should bear sentential stress and Focus feature, which may be projected over a larger constituents dominating GP.

The status of GP as unmarked Focus can thus be predicted by theories of Focus selection centered on syntax (such as Cinque 1993 or, for Romance, Zubizarreta 1998). Proposals that make Focus selection sensitive to 'argument structure' (for example, Winkler 1998) maintain that only arguments – as opposed to adjuncts – allow the Focus feature to be projected up to VP/S. I have argued elsewhere that GP is in the local syntactic domain of the main verb (París 2003a; París & Koenig 2003) and, hence, Winkler's proposal can be corroborated by SGC_C if 'argument structure' is not strictly interpreted in terms of lexical selection but rather more broadly in terms of 'local syntactic domain'.[14] Both of these syntactico-centered theories assume that linguistic forms come with a preconfigured information structure such that the selection of a constituent as Focus is not simply arbitrarily driven by context. In particular, both theories can be used to

[14]Winkler (1998) proposes that Resultative predicates in English bear the Focus feature in presentational structures (i.e. broad Focus in Ladd 1996) since this predicate is the lowest L-selected constituent. The Focus status of GP could then be predicted with the same rule that accounts for the English Resultatives: It is the lowest phrase in the L-domain of the verb. However, GP in $SGC_{C\text{-}CIRC}$ is also the unmarked Focus of the sentence but GP is not L-selected in this case (if L-selection is interpreted as 'subcategorization' and, hence, heavily semantically dependent, see among others Jackendoff 1990, Van Valin & LaPolla 1997).

derive the status of GP as unmarked Focus in SGC_C from independently motivated principles of the Syntax-Pragmatics and Syntactic-Prosody interfaces.[15]

So far I have presented different pieces of evidence that corroborate the Focus status of GP, which I have shown can be predicted from independently motivated principles. The central question that I would like to raise and answer in this section is of a different sort, though. It is about the motivation of the relation between the information carried out by GP – i.e. the event description $\delta(e_G)$ related by the Means relation to $\delta(e_M)$ – and the constituent bearing the Focus feature. Namely, the question is if there is a necessary link between $\delta(e_G)$ and GP. And, if indeed there is such a necessary link, is it either based on the Focus feature on GP or on the syntactic properties of GP that motivate the link?[16]

In section 2, it was shown that the expression of events in $SGC_{C\text{-MEANS}}$ can't be reversed; namely, $\delta(e_G)$ needs to be expressed by GP and $\delta(e_M)$ by the main clause. The inverse linking produces anomalous expressions as shown by sentence (43) repeated below.

(43) *#El niño corrió entrando a su habitación.*
the child ran entering to his bedroom
'The child ran into his bedroom.' (intended meaning)

Notice that the ban against inverse linking also holds for the subtype 'aggregate' of $SGC_{C\text{-MEANS}}$ in sentence (44a) as illustrated in (44b) and the 'causative' $SGC_{C\text{-MEANS}}$ sentence (14), repeated here in (45a), as illustrated in (45b).

(44) a. *El tenor canta gritando.*
the tenor sings screaming
'The tenor screams when he sings.'

b. *#El tenor grita cantando.*
the tenor screams singing
'The tenor screams when he sings.' (intended meaning)

(45) a. *El potro sorprendió al público saltando el corral.*
the stallion surprised to-the public jumping-over the corral
'The stallion surprised the spectators by jumping over the fence.'

b. *#El potro saltó el corral sorprendiendo al público.*[17]
the stallion jumped-over the corral surprising to-the public
'The stallion surprised the spectators by jumping over the fence.' (intended)

[15]The 'argument structure' and the 'purely syntactic' approach to Focus selection do not need to be competing since they might be valid for different languages; in fact, the former is believed to be true of English whereas the latter of Romance (Zubizarreta 1998).

[16]Notice that the Means relation has been defined as a relation between two event descriptions and, consequently, the events they denote. Since each event description is associated with forms of the same category – i.e. verb –, they have comparable distributional patterns, it is not thus obvious why the event descriptions needs to be mapped in only one way to the asymmetric syntax of the construction.

[17]This sentence can be made acceptable by making a pause between the main clause and GP but it takes a 'consequence' – rather than 'means' – interpretation.

I have argued that the oddity of these sentences above is semantically motivated; namely, Means is an asymmetric relation that assigns different 'roles' to its event-arguments such that it requires one event description to be more informative than the other in relation to the subevent they share. More precisely, the event descriptions in 'Means ($\delta(e_M), \delta(e_G)$)' are not symmetric in relation to the information that characterizes e_Z, the subevent they share.[18] In particular, $\delta(e_G)$ – information that I call Means proper – is more informative than $\delta(e_M)$. The question is why is it that the more specific description (i.e. $\delta(e_G)$) *needs* to be linked to GP and the less specific one *needs* to be linked to the main clause.

The semantic asymmetry could be systematically related to the asymmetric syntax. That is, the relevant interface pattern could be the following: The more specific description needs to be expressed by an embedded adjunct. There are data, however, that make this analysis improbable. In particular, some instances of $\text{SGC}_{\text{C-MEANS}}$ can be translated into the 'When' Adverbial Temporal Construction (ATC_{WHEN}). In order to do so, the expression of the events must be inverted as shown in (46), which asserts a mere temporal relation between the events associated by Means in (44a).

(46) *El tenor grita cuando canta.*
the tenor screams when sings
'The tenor scream when he sings.'

In contrast to SGC_{C}, ATC links the screaming event e_G to the main clause and the singing event e_M to the adjunct clause. If this linking is reversed – into the one that is appropriate for $\text{SGC}_{\text{C-MEANS}}$ – the sentence becomes semantically odd as shown in (47).

(47) *#El tenor canta cuando grita.*
the tenor sings when screams-he
'The tenor scream when he sings.' (intended meaning)

The behavior of ATC seems to corroborate that the cross-constructional generalization cannot be 'more specific event description $(\delta(e_G)) \leftrightarrow$ embedded adjunct' and 'less specific description $('\delta(e_M)) \leftrightarrow$ main clause'. Nonetheless, it could be argued that the former generalization doesn't hold simply because GP is, unlike adjuncts in general, in the local syntactic domain of the main verb (let's say that GP is in complement position). The behavior of GP in relation to island constraints and reordering indicates that GP is in the L-domain of the main verb (París 2003a; París & Koenig 2003). Thus, we could still support a syntactic-pragmatic linking just as Winkler's analysis of the English Resultative Construction in which the secondary predicate is the lowest L-selected argument and, hence, predicted to bear the Focus feature; the correlation would then be 'more specific event description (i.e. $\delta(e_G)) \leftrightarrow$ lowest phrase in the L-domain'. However, linking GP to Focus on the basis of its position in the L-domain of the main verb does not offer any motivation for the need of Means proper to be expressed by GP nor does it explain why comparable relations are expressed in ATC in the reverse syntax. I argue instead

[18]Notice that it could be possible to state the asymmetry in terms of 'events'; for example, we could say that e_G – the second argument of Means – needs to be the initial part of the macro-event whereas e_M extends over the whole macro-event. There are cases, however, where that generalization does not hold; for example, it is possible to say *Juan camina rengueando* 'Juan walks limping'. Reversing the expression of the events is not possible (*#Juan renguea caminando*); still, we can't say that the limping event extends over a shorter interval than the walking event in relation to the 'walk limping' event.

that the proper interface generalization that is both explanatory for $\text{SGC}_{\text{C-MEANS}}$ and valid on a cross-constructional basis resides on the semantics-pragmatics interface.

It is broadly accepted (Stump 1985; Johnston 1994) that the embedded adverbial clause in ATC expresses the presupposed information whereas the main clause expresses the Focus. Therefore, it is the linking between, on the one hand, the more specific description (i.e. the one expressed by 'screaming' or $\delta(e_G)$) to Focus and, on the other hand, the less specific event description (i.e. the one expressed by 'singing' or $\delta(e_M)$) to the non-Focus content that remains constant across both constructions. It is a property of the Means information that is necessarily associated with the Focus feature rather than with a syntactic position. In other words, Means is expressed by GP based on its status as the unmarked Focus of the construction rather than on its syntactic properties.

In the case of SGC_{C}, it is the lexical and conversational value of the information carried by each constituent that is particularly relevant for explaining the Focus-Means association. The Means information introduced in $\delta(e_G)$ is lexically underspecified and syntactically not subcategorized. Therefore, this information is not anticipated by the main verb's entry (as the other constituents are) nor is it grammatically required; therefore, its expression can be only justified on Gricean grounds: The speaker evaluated that, based on its descriptive value, it was 'necessary' information required by the Q1 maxim.[19]

The intrinsic contrastive nature of the Means information in Spanish also contributes to its association with Focus. The relevance of 'contrast' in the selection of Focus beyond 'contrastive' Focus is widely accepted (Rooth 1996; Valduví & Vilkuna 1998; Kadmon 2001). The fact that GP introduces information that cancels out an implicature makes the Means information contrastive in the broader sense. Under unmarked intonation, the 'alternative set' in sentence (3) isn't the set of possible events that could have been performed by the child nor the set of alternative ways in which the entering event could have been performed but the set that contains 'enter walking' – i.e. the Means Expanditure – as a member. Therefore, the Means-Focus association is ultimately an effect of the fact that it is not lexically encoded but pragmatically communicated in Spanish.

In sum, this section presented an interface pattern underlying the expression of Means in Spanish. The backgrounded status of Means information at the lexical level is reversed if Means is explicitly expressed; namely, Means is lexically underspecified but it is necessarily associated with Focus if explicitly expressed. The motivation of the Means-Focus correlation can be traced back to the optional status of the Means information – which makes it salient based on Gricean principles – and the 'contrastive' nature of the information contained in $\delta(e_G)$.

5 Discussion of alternative approaches

I have argued that expenditures are conversational inferences that complete lexical entries with calculable, cancelable, non-detachable and context independent information. Can they be just identified with 'implicitures' (Bach 1994, 1999)? Implicitures are inferences that are associated with truth-conditional information. For example, sentence (48) can only be evaluated if the im-

[19]The definition of the Q and I principles in terms of a 'surprising' effect on encoding (Blutner 1998) would also motivate the attraction of Focus to Means. The explicit expression of Means is 'surprising' not only in that it changes the common ground and contradicts our expectations (i.e. ME), but also because it does not need to be expressed (i.e. associated with a piece of linguistic form).

pliciture that describes the relevant action for which steel is said to be strong is drawn; crucially, sentence (48) cannot otherwise be assigned a truth-value.

(48) Steel is not strong enough. (from Bach 1994)

In contrast, expanditures do not contribute truth-conditional information. Sentence (1) can be determined to be true or false even if the information about Means of Motion is lacking.

It is a rather more difficult matter to distinguish 'expanditures' from 'explicatures'. In Relevance theory explicatures and implicatures are two different kinds of pragmatic inferences involved in the interpretation of an expression. Sperber & Wilson (1986) deem that the characteristic property of explicatures is that they are 'developments' of encoded information (i.e. logical forms). This is also a defining property of expanditures and, hence, it may be that this category is altogether redundant. There are, however, crucial differences. For example, if explicatures are understood as carrying truth-conditional information (Levinson 2000), I have shown above that this is not the case for expanditures. In contrast, Carston (2000) argues against reducing 'explicatures' to truth-conditional information; in the context of an ambitious project that redefines the explicit/implicit contrast, explicatures are defined as explicit information that is, however, drawn through pragmatic inferences by using the principle of 'relevance'. However, MEs contain 'implicit' information since it is about the specific way a participant carried out a subevent and this information is not asserted in the sentences we have analyzed. That is, the subevent described by the Means implicature is introduced by the main verb as I have shown earlier, but the information about the way in which this event is carried out is absent and, hence, cannot be asserted; stretching the concept of 'explicit' so as to include the Means information would be far fetched and counterintuitive. In addition, Carston (1988) makes clear that explicatures have a different 'function' than implicatures; typically, explicatures fill in information that is required to draw an implicature. Clearly, ME does not have this function in the sentences we have analyzed; rather, it needs implicit premises to be drawn.[20]

An alternative analysis to the one presented here might be purely a semantic one. The completion of an underspecified lexical entry with Means of Motion information could be understood as an instance of 'logical metonymy' and, hence, can be compositionally derived from lexical representations containing Qualia structures (Pustejovsky 1991, 1995). In Pustejovsky's description, sentence (50) is interpreted as meaning 'the student enjoyed reading the book' through a compositionally derived interpretation that assumes lexical representations in terms of Qualia.

(49) The student enjoyed the book.

The Qualia structure of 'book' contains the value 'read(y, x)' for the attribute Telic; this information specifies the event structure of the verb 'enjoy' after the unification of both items; then, the right interpretation obtains.

It has been noticed that Pustejovsky's proposal needs to be enhanced with default operators (Copestake & Briscoe 1995) that account for exceptions. However, not even this amelioration

[20]Ultimately, the comparison between the concept of 'explicature' and 'expanditure' might be 'incommensurable' since they are framed in different theories. In particular, explicatures are couched in a theory that assumes the principle of relevance as the sole rule of inference and that leans toward the description of the interpretative process. In contrast, I have assumed a different inference rule – the Q2 maxim – and tried to show pieces of evidence to support the claim that ME is part of the speaker's intended communicative intention.

can make the compositional approach derive the information carried by ME. In order to derive the interpretation 'enter walking' from 'enter' the compositional approach should encode 'prototypical motion' as the value of a Qualia attribute in the lexical representation of the noun 'professor'. However, this information is not naturally encoded as a value of any of the Qualia attribute. For example, the attribute 'Constitutive', which encodes the part-whole relation intrinsic to the entity, cannot directly encode 'walking' as a part of the entity denoted by 'professor'. On the one hand, the amount of information in a noun phrase would have intractable proportions if every relation we can predicate of the entity is encoded. On the other hand, I have shown that 'walking' can be considered the default Means of Motion for humans only in relation to a specific kind of Paths, which makes encoding it as a property of the entity even less plausible.

Means of Motion information is too restricted to be considered as grammatically encoded in the meaning of a noun on an equal foot than its argument or Qualia structure. In particular, the fact that the prototypical Motion of an entity is dependent upon the actual Path makes the grammatical encoding of Motion yet more improbable.

6 Conclusion

In this paper I have described the interface properties of the communication of the Means relation in Spanish. Means, which was defined as an asymmetric relation between two overlapping events constituting a single macro-event, is not typically encoded in Motion and Causative verbs in Spanish. Utterances containing these verbs denote events whose initial parts are not fully specified with the lexically encoded information. Means is not asserted but it is nevertheless communicated through a pragmatic inference that was termed Means Expanditure. MEs are implicatures that complete lexically underspecified information and are drawn from the asserted proposition, implicit premises that convey shared default knowledge about the participants involved in the described events, and the R/I principle that prevents speakers from expressing redundant information. In addition, different pieces of evidence have been presented in support of attributing ME to the speaker's communicative intentions rather than taking ME to be merely elaborative inferences.

The second part of this paper studied the interface properties of $SGC_{C\text{-}MEANS}$, the construction that explicitly express the Means relation. It was concluded that the gerund phrase – the constituent that expresses the Means information – is prosodically and pragmatically more prominent than the other constituents. This prominence is identified with the category Focus; namely, GP carries the Focus feature in $SGC_{C\text{-}MEANS}$ sentences and this characteristic allows us to derive systematically a number of properties intrinsic to the construction. In particular, two relevant interface alignments surface; first, the information that is 'lexically backgrounded' – i.e. not specified – is pragmatically prominent if expressed; and, second, the semantic asymmetry intrinsic to the Means relation is systematically mapped into information structure such that the more specific event description needs to be expressed by the constituents carrying the Focus feature.

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MOOD AND INTENSIONALITY

MOOD, PROPOSITIONAL ATTITUDE AND METAREPRESENTATION IN SPANISH

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The Romance subjunctive mood has often been mentioned in relation to the notion of propositional attitudes, but little research has addressed this relationship in detail. In this paper, the way the indicative and subjunctive moods can reflect the speaker's propositional attitudes, on the one hand, and the relationships between mood and the lexical semantics of propositional attitude predicates, on the other, will be considered. The central goal of this research is to explore the interaction between the pragmatic aspects of the indicative-subjunctive distinction and the semantics of the linguistic contexts that determine mood selection.

The most successful pragmatic approaches to analysing the Spanish subjunctive, along the lines of Terrell & Hooper (1974) or Bolinger (1974), among many others, are built on the claim that the subjunctive is used when the speaker expresses a proposition as "not asserted". However, the proposal that the semantics of the subjunctive encode the non-assertion of a proposition seems to require further refinement. I would like to propose that Relevance Theory provides analytical tools which can be applied to the analysis of the subjunctive, building on the hypothesis that mood expresses information regarding the assertion of propositions, and which can perhaps offer further insight into the pragmatic mechanisms brought into action by the use of the subjunctive.

The claim I put forth is that the subjunctive mood is a particular mark of metarepresentation, showing that the speaker intends to express the proposition as what is known within Relevance Theory as an *interpretive representation*, or to ascribe such a representation to the holder of the propositional attitude. Both in contexts where a lexical item selects the subjunctive, and in those in which the speaker has the option to choose this mood, the effects of its use consist in communicating that the proposition represents, by virtue of a relation of resemblance in content, another utterance, thought or assumption. The information from the sentential and communicative context incorporated into the interpretation process, based on the hearer's search for relevance, determine both the source of the representation being metarepresented, and the inferential effects that can be derived from the presence of the subjunctive. In sum, I will propose that the semantics of the subjunctive mood restrict the inferential processes of identification of implicit propositional attitude information, which may include interpreting the proposition as echoing a previous utterance, as representing a state of affairs regarded as possible, or as a potential utterance or thought.

Taking into consideration some of the linguistic contexts involved in the selection and licensing of the subjunctive in Spanish, I will formulate an explanation for some data which has not been accounted for in previous studies on verbal mood. In particular, regarding the linguistic contexts in which the subjunctive is optional, the explanatory scope of the present proposal can

be seen as offering further insight into the effects of its use on utterance interpretation. In the first section, a brief overview of the linguistic contexts that select or license the subjunctive in Spanish will be offered. The licensing contexts, where the choice of mood is optional, will prove to be fundamental to this proposal, since they clearly show the effects of mood choice on interpretation. However, semantic selection by embedding predicates can also fit into the analysis. In section 2, information on the basic premises developed within Relevance Theory that will be implemented in the analysis is provided. Sections 3 and 4 are devoted to analysing examples of selection and licensing of the subjunctive, respectively; and the effects of the interaction of sentential operators and mood choice are discussed.

1 Mood selection and licensing

The linguistic contexts in which the Spanish subjunctive can appear include argument clauses, adjuncts, such as adverbial and adjectival clauses, and finally, though they will not be discussed in the present paper, independent sentences introduced by adverbs of doubt or with optative interpretations (such as *Tal vez llueva* (Perhaps it will rain); *¡Póngame otra copa!* (Pour me another drink!), respectively). The subjunctive appears in argument and adverbial clauses due to the *selection* requirements of embedding predicates or of certain adverbs, whereas it can appear as a result of operator *licensing*, for example in negative and interrogative environments, in both argument clauses and adjuncts.[1]

1.1 Selection by embedding predicates

For instance, in sentences such as:

(1) *María quiere que coloquemos sus zapatillas al lado del sillón.*
María wants that we-put (subj.) her slippers beside the armchair.

(2) *Lamentaron que tuvieras que repetir el examen.*
They regretted that you-had (subj.) to repeat the exam.

we find two examples of subjunctive mood selection by embedding predicates. As pointed out, for instance, in Farkas (2003), the semantics of mood must be spelled out in relation to the types of contexts created by subordinating predicates. Predicates that take sentential complements create *embedded contexts* in which those complements are interpreted; the type of embedded context created by these predicates, as opposed to the context of utterance, determines mood selection. In Spanish, both volitional predicates, such as *querer* (to want), which are opacity-creating elements that create nonfactive contexts, and factive predicates like *lamentar* (to regret), which presuppose their argument propositions and express an emotional reaction to them (factive-emotives) select the subjunctive. One of the challenges for a coherent analysis of the semantics of mood is to explain why the subjunctive is selected in both of these seemingly disparate environments.

[1] Although due to lack of space they will not be discussed here, some predicates in Spanish allow both the indicative and the subjunctive. Among them are verbum dicendi (communication predicates), such as *decir, comunicar, avisar, escribir* and *señalar* (to say, communicate, notify, write and to signal) and verbs of acceptance and understanding, like *entender, comprender,* and *aceptar* (to understand, comprehend and accept). In Ahern (2005) the effects of mood choice in the complements of these predicates are described.

1.2 Operator licensing

However, as mentioned above, the subjunctive can be either selected by an embedding predicate, or licensed by an operator such as negation or in interrogatives. For instance, the negation of what I will label epistemic predicates – those of knowledge, perception, acquisition of knowledge, or belief, which in other circumstances require the indicative – can license the subjunctive in the argument proposition, and in this case it has been claimed (Quer 1998:80) that the choice of mood is directly related to the speaker's propositional attitude:

(3) a. *Juan no sabe que María tiene el informe.*
Juan doesn't know that María has (ind.) the report.

b. *?Juan no sabe que María tenga el informe.*
Juan doesn't know that María has (subj.) the report.

c. *Juan no cree que María tiene el informe.*
Juan doesn't believe that María has (ind.) the report.

d. *Juan no cree que María tenga el informe.*
Juan doesn't believe that María has (subj.) the report.

An utterance like (3a) communicates that the embedded proposition represents information that the speaker knows about, but Juan does not. The choice of a predicate of knowledge is associated with the speaker's positive epistemic attitude, and the indicative is the standard choice for the embedded clause. In (3b), the combination of the fact that the speaker chooses to describe Juan's propositional attitude as one of knowledge, together with the choice of the subjunctive for the complement proposition, results in an anomalous utterance. The explanation for this, according to the proposal I will argue for in the present paper, is that the subjunctive reflects the speaker's choice to present the propositional argument as an attributive interpretation, which contrasts with the attitude of belief communicated by introducing an embedding context with the predicate *know*. The combination of such contrasting implications can lead to different conclusions, for instance when there exists an obvious motivation for presenting the embedded proposition as an attributive interpretation (e.g. when it reproduces some aspect of an utterance from the previous discourse), or when tense distinctions are brought into the picture, allowing for a speaker to characterise as knowledge in the past a proposition that is presently known to be false.

In (3c), however, the use of the **indicative** is more dependent on certain contextual conditions to obtain a natural interpretation. In unmarked constructions, a negated predicate of belief in Spanish would appear with the propositional argument in the subjunctive, as in (3d). A typical use of this type of construction would be motivated by the intention to express information on the attitude holder's (i.e. Juan's) opinion regarding the truth of the argument proposition, presumably because the speaker herself lacks knowledge of whether or not it is true, and this would best be reflected by the choice of the subjunctive.

The use of the indicative under a negated predicate of belief, as in (3c), invokes a metalinguistic reading of the negative operator, and a quotative interpretation of the argument proposition.[2] The speaker's choice of the indicative in this environment induces the hearer to assume that one of the contextual assumptions is that María has the report. The indicative shows that the speaker

[2]As pointed out by one anonymous reviewer, this type of interpretation is also related to the interaction between mood choice and information structure. Evidence for such interaction includes, for instance, the fact that the subjunctive is odd in a pseudo-cleft construction such as:

is picking out that contextual assumption and denying it, rather than simply communicating information on Juan's opinion. The reasons why this result is obtained by the use of the indicative will be analysed below.

This kind of use of the subjunctive (known as "polarity subjunctive" (Quer 1998; from Stowell 1993) clearly shows that the semantics of mood is related to the propositional attitudes that can be identified through both embedding the proposition under attitude predicates, and inferentially, through the reasoning processes which operate on contextual and linguistic information in the interpretation process. In this sense, verbal mood apparently does not map onto any specific propositional attitude information, but rather expresses more abstract information regarding the way in which the speaker intends the proposition to be interpreted: specifically, the subjunctive affects the interpretation process by communicating that the proposition is a manifestation of interpretive use.

2 Relevance Theory, semantics and pragmatics

2.1 Theoretical background

The theoretical framework for the analysis to be proposed is based on the cognitive theory of communication developed by Sperber & Wilson (1995), Relevance Theory. Relevance Theory (RT) is based on the conception, first introduced by Grice, of human communication as involving the expression and recognition of intentions, rather than as a message encoding and decoding process. On this view, the linguistic meaning recovered by decoding constitutes only one of the kinds of input used in the inferential process of interpreting an utterance; the assumptions available in a given communicative context are also integrated into the interpretation. According to RT, an essential part of the communicative process is the contextualisation of the utterances produced in discourse. Each utterance is processed against a background of contextual information, which includes the assumptions available to the participants in the discourse, derived from perception, from the individual's encyclopaedic memory, or from what was expressed in, or inferred from, the previous discourse. Relevance is characterised in terms of cognitive effects – the results of the interaction between the content explicitly expressed by an utterance and the hearer's assumptions, which may include contextual implications, confirmation or revision of the hearer's existing assumptions – and the mental effort necessary to process the stimulus and derive its contextual effects. Other things being equal, the greater the contextual effects derived from an utterance, the greater the relevance; and likewise, the lesser the processing effort required to interpret an utterance, the greater its relevance.

In fact, in linguistic communication, it is the presumption that the speaker intends to be relevant, that she[3] intends to create some cognitive effects for the hearer, which warrants her

(i) ??*Juan no es el que cree que María* {*tiene* / ??*tenga*} *el informe.*
Juan no is the which believes that María {has (IND) / ??has (SUB)} the report
'Juan isn't the one who believes María has the report.'

This observation is related to the fact that the pragmatic conditions for an utterance such as this one would include a contextual cue indicating that the embedded proposition is a belief that someone has attributed to Juan: the content of the embedded proposition echoes (part of) a previous utterance or possible utterance, as will be discussed in more detail below.

[3]For convenience, the speaker will be referred to as she, and the hearer, he.

demand for the hearer's attention by producing an utterance. All of these ideas are spelled out in the following principles (Sperber & Wilson 1995:260):

(1) [Cognitive Principle of Relevance]
Human cognition tends to be geared to the maximisation of relevance.

(2) [Communicative Principle of Relevance]
Every act of ostensive communication communicates a presumption of its own optimal relevance.

RT describes, as can be seen, both a central characteristic of human cognition and the role of this characteristic in communication. In the Communicative Principle of Relevance, the fact that speakers create expectations of relevance in their audience by attempting to communicate with them is described. It is this *presumption of optimal relevance* that specifies more precisely the expectations regarding effort and effect which are created in the audience by an act of ostensive communication (Wilson & Sperber 2002:256):

> *Optimal Relevance*:
> An ostensive stimulus is optimally relevant to an audience iff:
>
> (a) It is relevant enough to be worth the addressee's processing effort;
>
> (b) It is the most relevant one compatible with the communicator's abilities and preferences.

These basic notions and principles are the fundamental elements of the RT framework. The processes involved in utterance interpretation have been described extensively within this theory, and especially the roles of decoded semantic information in relation to the communicative content that is pragmatically inferred based on the principles.

The explicit content – *explicatures* – of an utterance is derived in part from semantic decoding, and in part by pragmatic processes such as disambiguation, reference resolution and other types of pragmatic enrichment. There are several levels of explicit content: the basic explicature, which is a development of the logical form of the utterance, and higher-level explicatures. *Higher-level explicatures*[4] involve the illocutionary and propositional attitude information the speaker intends to communicate. In RT, intended speech acts or propositional attitudes can be inferred based on contextual or paralinguistic cues (gestures, intonation), indicated by the use of non truth-conditional expressions such as parentheticals, or form part of the basic explicature of an utterance, as in propositional attitude reports.

The explicatures of an utterance provide input to the inferential processes and interact with contextual assumptions, or implicated premises; this interaction is used by the addressee in order to construct hypotheses about the intended contextual implications, the implicated conclusions.[5] As mentioned above, these contextual assumptions may be derived from different sources. One of them is the discourse situation itself, which provides the participants with a number of *manifest assumptions*: those assumptions that they are capable of mentally representing and accepting

[4]For further details on higher-level explicatures, see Wilson & Sperber (1993), Carston (2002, 2004).

[5]See Sperber & Wilson (1995); and Wilson & Sperber (2002) for a full description of the inferential processes of interpretation

as true or probably true (Sperber & Wilson 1995:39). The central goal of communication lies, according to RT, in affecting the set of assumptions that are manifest to the audience by providing evidence for or against them.

A distinction which has become fundamental to semantic analyses within RT regarding the way different linguistic items contribute to communication is the one between *conceptual* and *procedural* encoding, first developed in Blakemore (1987). Some expressions encode concepts that are constituents of the explicatures of an utterance, i.e. of explicitly expressed conceptual representations; others encode procedural information on how these conceptual representations are intended to be constructed and manipulated during the interpretation process. Procedural expressions contribute to the relevance of an utterance by indicating the types of inferential processes the speaker intends the hearer to carry out. They constrain the inferential phase of comprehension and reduce the overall processing effort required by guiding the hearer towards the appropriate contexts, explicit contents or cognitive effects. Their interpretations operate, unlike conceptual ones, below the level of consciousness, as they map onto the computational processes involved in interpreting an utterance, such as reference assignment, the identification of temporal relations, or of logical relationships among the constituents of a proposition or among the propositions expressed in an utterance.[6] In previous research within the relevance-theoretical framework, categories such as discourse connectives (Blakemore 1987, 2002), determiners (Leonetti 1996), tense (Moeschler 2004), evidential particles (Ifantidou 2001), mood (Rouchota 1994), and intonation (Escandell-Vidal 1998) have been analysed as procedural expressions.

As will be argued in the following sections, verbal mood directly affects the inferential processes of interpretation, although it does not encode any conceptual content. Specifically, the use of the subjunctive can create a number of effects in the identification of the higher-level explicatures of an utterance, which are the results of its interaction with the semantic properties of the linguistic and extra-linguistic context. The proposal I would like to argue for is that the subjunctive carries a procedural indication which marks the associated proposition as a case of *interpretive use*, i.e. a metarepresentation of another proposition.

The final notion included in this brief sketch of some of the analytical tools developed within RT is the distinction between *descriptive* and *interpretive* uses of language. Speakers can use utterances, or the propositions they express, either to describe states of affairs, or to represent some other representation. In the latter case, the relationship between the proposition expressed, and the proposition it is intended to interpret, is one of resemblance in content: they share logical properties, and in particular, logical and contextual implications.

Interpretive use, then, is a kind of *metarepresentation* in which a speaker chooses to represent some other representation, whether it be attributed to some other contextually salient individual, or to the speaker herself under circumstances different than those of the utterance.[7] The relevance-theoretic notion of interpretive use covers the metarepresentation of a variety of types of representations: a speaker can interpret an actual utterance from the previous discourse, a potential utterance, an actual or possible thought attributed to some individual, or, more abstractly, a proposition which is not attributed to any particular source. The notion of interpretive use has been applied in research on a wide variety of communicative and linguistic phenom-

[6] See also Wilson & Sperber (1993).

[7] For further examples of the ways in which interpretive use is grammaticalized in different languages, see for example Andersen & Fretheim (2000).

ena, such as quotation, irony, humour or translation.[8] For instance, irony has been analysed as a type of interpretive use representing *attributed utterances or thoughts* which, coupled with the speaker's dissociative attitude towards the attributed representation, has certain stylistic effects that are not achievable through literal uses of language. Quotation, especially free indirect quotation, typically involves attributed utterances or thoughts, but speakers can also interpret abstract representations, such as concepts, propositions, sentence types, or names.

2.2 An analysis of the subjunctive based on Relevance Theory

In the next sections of the paper I discuss the semantic contexts that select the subjunctive, and the restrictions that they place on their propositional arguments. It will be argued that the analysis of the subjunctive as a procedural expression marking the interpretive use of a proposition can offer a generalisation which, using RT conceptions of the interaction of contextual assumptions with semantic content, explains how verbal mood affects the identification of speaker propositional attitude in a variety of ways. Due to the procedural nature of the category of verbal mood, it guides the processes leading to the identification of the speaker's propositional attitude, although it does not itself encode any specific kind of attitude.

3 Lexical selection of the subjunctive

3.1 Volitional predicates

Propositional attitude predicates, according to many researchers (e.g., most recently, Farkas 2003; Schlenker 2003; Quer 2001) create embedded or derived contexts with particular characteristics that depend on their lexical semantic properties. Mood selection is seen as a reflection of the semantic characteristics of the subordinating predicates, which determine the types of embedded contexts that they create.

For instance, Quer (2001) proposes, regarding mood in Romance languages, in particular Catalan and Spanish, that the selection of the subjunctive marks a shift in the type of model of interpretation – i.e. set of worlds associated with an individual anchor – the proposition is intended to be evaluated in. Predicates of belief, for example, create epistemic models; since the default model is epistemic, that is, reflects the speaker's world view, what follows from her knowledge and beliefs, these predicates do not select the subjunctive; the type of model remains the same for the interpretation of both the main and the subordinate clause propositions. On this view, in a sentence such as:

(4) *Juan cree que está lloviendo.*
Juan believes that it-is (ind.) raining.

the predicate of belief creates an embedded context that represents the epistemic world of the referent of the matrix subject, Juan. Thus, the complement proposition is interpreted as belonging to Juan's epistemic world.

[8] See, for instance, on metarepresentation in linguistic communication, Wilson (2000); on metarepresentation in epistemic modality, Papafragou (2000); in relation to propositional attitudes, Bezuidenhout (2000).

The selection of the subjunctive by desiderative predicates, as shown in (1) above (*María quiere que pongamos sus zapatillas al lado del sillón.*), is related to the "model shift" introduced by their semantics. According to Quer's proposal, the subjunctive reflects the shift from the default model, claimed to be the epistemic model of the speaker, to the buletic model of the matrix subject, which is triggered by the use of volitional predicates, e.g. *querer* ('want'). Since this shift affects the *type* of model, the subjunctive is selected, in contrast with what occurs under "epistemic" propositional attitude predicates, as in example (4), where the type of model remains unaltered and, as a consequence, the indicative is required. Thus, as stated above, the subjunctive marks a shift in the type of model, whereas the indicative is used when the type of model remains stable (although the individual anchor may vary) for both the context of utterance (the default model) and the embedded context introduced by the subordinating predicate.

"Model shift" under volitional and directive predicates, according to Quer (2001:83), is related to the fact that "[...] volitionals or directives introduce a set of worlds that model alternative realisations of the actual world according to the preferences of the matrix anchor, and in this sense they contribute a model of buletic alternatives ($M_{Bul}(x)$)." Similarly, the proposal on the semantics of the Spanish subjunctive put forth by Villalta (2000) regards the semantics of volitional predicates as introducing a comparison among alternative propositions. The subjunctive, thus, is seen as a morphological mark of the semantics introduced by strong-intensional predicates, and is selected when a predicate introduces a set of future (or non-anterior) alternative worlds.

The proposal that the subjunctive is a procedural indicator of interpretive use can account for its selection under such predicates in a similar way, as will be explained below. However, one question that such previous analyses leave unanswered can be explained on the current approach: the reason why the subjunctive should exist at all. If the accounts mentioned above propose that the subjunctive appears in subordinate clauses as a reflection of the particular semantic properties of certain embedding predicates, why should it not be enough to simply have predicates with such semantic properties, since it is assumed that they provide sufficient information regarding the speaker's intentions of the model in which the complement proposition has to be interpreted?

In order to provide a satisfactory answer to this question, however, the general properties of propositional attitude reports and the semantic environments created by intensional predicates should be considered so that the role of verbal mood itself can be distinguished from the effects that are consequences of the particular sentential contexts it is used in. On the one hand, the propositions embedded in propositional attitude reports have been the object of much philosophical and semantic research. Frege (1952) first established that the referring expressions used within 'that'-clauses in propositional attitude reports shift their referents, so that instead of referring, as in other contexts, to their standard referents, they refer to senses. On this view, words in attitude reports have referents which are different to the ones they have when they are used outside of attitude contexts. An opposing view, developed by Davidson (1984) and elaborated on by authors such as Recanati (1997), holds that words cannot be said to have different referents depending on whether or not they appear in attitude reports. Although in order to keep to the point of the present study I can only briefly mention Recanati's proposal here, for the present purposes it can be summed up in the idea that 'that'-clauses cannot be referring terms, whether to senses or to referents, since then the function of the proposition that they contain could only be said to play a "pre-semantic role analogous to that of the demonstration which accompanies a demonstrative" (Recanati 1997:17). Recanati proposes, on the contrary, that 'that'-clauses can refer to either the proposition expressed by the embedded sentence, or to a proposition obtained by contextually enriching the proposition expressed.

Bezuidenhout (2000) proposes an alternative approach, which is in accordance with what will be assumed in the present paper. She maintains that the contents of a 'that'-clause consist of a *mode of presentation* of the expressed proposition, and that the semantics of the complementizer *that* can be described as a procedural instruction to interpret the content it introduces as resembling, in a contextually appropriate way, the content of a truth-evaluable sentence. Hence, the proposition expressed in such contexts can be seen as referring to a proposition which resembles the one being ascribed to the attitude holder in contextually appropriate ways. In attitude ascriptions, it is not claimed that the actual proposition that the attitude holder entertains forms part of what is said, but rather, that the speaker shows her intention present the content of that proposition in order that it should be recognisable in a way that is appropriate to the particular communicative goal of the utterance.

Assuming Bezuidenhout's analysis, then, the function of verbal mood within propositional attitude reports can be understood in the following way. Firstly, as we have just seen, the semantic environment of embedded propositions encodes an indication that their content is intended to resemble, in a contextually appropriate way, the proposition which is attributed to the attitude holder, A. Verbal mood constitutes and indication of the cognitive status of the attributed propositional representation itself: when, for instance, the proposition is embedded under a volitional predicate, the subjunctive reflects the intensionality of the proposition P that is being attributed to A (as opposed to affecting the interpretation of the proposition expressed by the speaker herself, which is not identical to the one entertained by A, but rather, resembles it in an appropriate way). The semantics of volitional predicates imply, as will be discussed below, that A entertains the eventuality which is referred to in the representation being attributed to her as a possible state of affairs, $\Diamond P$, corresponding roughly to situating the proposition within what Quer calls a *buletic model*; in cognitive terms, the speaker attributes to A an interpretive representation of a proposition which is held to represent a potential eventuality. The subjunctive is required in such contexts in order to indicate that the proposition that the speaker expresses embedded in the attitude report, constitutes the metarepresentation of A's interpretive representation of the possible eventuality.

The interaction of the procedural meaning of the subjunctive with the conceptual content encoded by volitional predicates, due to their intensional properties, leads to the conclusion that the embedded proposition represents another proposition, which in turn is ascribed to A as a representation of a possible state of affairs. However, in other contexts, such as sentences with factive-emotive predicates like *lamentar* or *alegrarse* (to regret, to be glad), the semantics of the subordinating predicate can restrict the interpretation of its argument as a contextually accessible assumption. What I will propose is that the link between these two types of interpretations obtainable from the subjunctive lies in the procedural indication that the proposition expressed, P', is an interpretive representation of another proposition, P, whether it is intended to represent the attitude holder's representation of a possible state of affairs ($\Diamond P$), or the propositional representation of a contextual assumption, that is, information which is accessible in the communicative context. Thus, depending on the processes of semantic composition of the interpretation of the complex sentence which the subjunctive proposition constitutes a component of, determined by the semantics of the embedding predicate and the contextual assumptions accessed by the addressee, the subjunctive leads the process of interpretation in one direction or another, as shown in Figure 1 below.

The role of the subjunctive within attitude reports, then, can be seen as a grammatical indication that the embedded proposition is an interpretive metarepresentation of a proposition. The

role of the matrix predicate, on the other hand, is to determine whether the proposition expressed is intended to metarepresent the attitude holder's representation of a possible state of affairs, or of a contextually accessible assumption. Through the use of the subjunctive, the speaker expresses an indication which guides the inferential processes involved in the identification of the source from which the proposition is attributed: depending on the particular semantic properties of the matrix predicate, and on the contextual assumptions brought into the interpretation process, the content will be identified in one of the two ways shown in Figure 1. Although when verbal mood is grammatically selected the burden of interpretation lies more heavily on the conceptual semantics of the subordinating predicate, in other environments, the inferential processes activated by the subjunctive itself will incorporate the necessary contextual assumptions in order to determine whether the proposition is intended to represent a possible eventuality, or to reproduce a contextually accessible assumption. Thus, in a more abstract way than the use of fully lexicalised indications of sources of information, verbal mood can be seen as a device for classifying the sources of propositional representations. This general stance on the communicative function of verbal mood is also supported by the conclusions of current research on the German Konjunktiv mood, or "reportative subjunctive" (see Fabricius-Hansen & Saebø 2004).

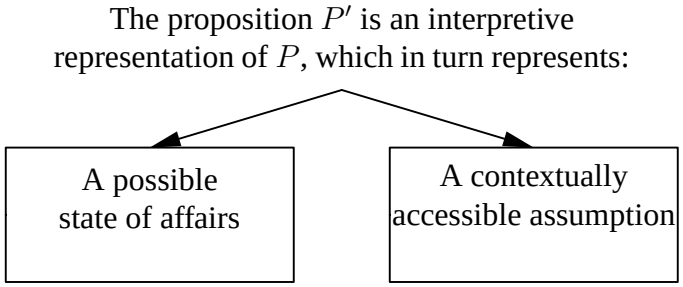

Figure 1: Inferential processing of the subjunctive mood

Nevertheless, the present proposal still needs to explain why certain semantic environments require the subjunctive. As stated in the studies mentioned above (Quer 2001; Villalta 2000, for example), the consistent selection of the subjunctive in volitional contexts, both cross-linguistically and in Spanish in particular, is undoubtedly related to the type of embedded contexts that they create. From a cross-linguistic perspective, it has been observed that the contexts which select the subjunctive most consistently across languages are volitional, desiderative and directive ones (e.g. Giorgi & Pianesi 1997:213). In Spanish, the fact that volitional and directive predicates select for the subjunctive more robustly than any other group of predicates is another indication of a strong link between the type of contexts created by these predicates and the subjunctive mood. The relative strength of this connection can also be observed by comparing the characteristics of other subjunctive selection environments. For instance, in many western Romance languages including Spanish, the subjunctive is also selected, as will be discussed in the next section, by factive-emotive predicates, whose properties lead to the interpretation shown on the right of Figure 1: that the proposition being metarepresented is a contextually accessible assumption. However, the selection requirements can be described as more flexible in the latter case than in that of volitional contexts: indicative complements are completely ungrammatical under volitional predicates, whereas under factive-emotive predicates they are grammatical in

some dialects of Spanish (see Lope Blanch 1990, and Bosque 1990:46)[9]and are admitted under some of these predicates in standard Peninsular Spanish. In addition, the selection of the subjunctive by factive-emotive predicates is not stable across the Romance languages: in Italian and Romanian, for instance, these predicates select the indicative.

The contexts created for the interpretation of the propositions embedded under volitional predicates are characterised by the intensional features of volition: the idea that the situations desired for should be, in some sense, *unrealised* or *unactual* ones. Therefore, volitional predicates have been analysed in semantic research as requiring complement propositions expressing states of affairs that the speaker considers unrealised. For instance, Barker (2000:21), who also cites similar proposals in Heim (1992:194) and Portner (1992:201), emphasises that predicates such as *want* require that their complement propositions should not be entailed in the context of utterance. Portner (1992), for instance, states that "Intuitively, wants must be for states of affairs that are believed to be as of yet undertermined as to whether they will be actualized". As Barker notes, this requirement, which he calls the "unactuality requirement", is similar to a presupposition, since it places conditions on the admissible evaluation contexts for the utterance. However, strictly speaking it cannot be considered a presupposition, since it is essentially equivalent to requiring that the propositional argument should **not** be presupposed.[10] Thus, it is assumed that an utterance such as:

(5) *Jorge exigió que el empleado le llevara las maletas.*
Jorge demanded that the employee CL carried (subj.) the suitcases
'Jorge demanded that the employee carry his suitcases.'

The embedded proposition should represent a state of affairs which is considered unrealised at the matrix clause reference time (i.e. that the employee was not carrying Jorge's bags when Jorge demanded it).

[9]For instance, Bosque (1990:46) cites the following examples, from Mexican (a) and Colombian (b) Spanish.

(i) a. *Estoy muy satisfecha de que supo terminarlo* el *solo.*
(I) am very satisfied that knew (ind.) to finish-it he alone
'I am very satisfied that he was able to finish it alone.'

b. *Me alegro de que conseguiste empleo.*
me pleases of that you-got (ind.) work 'I'm glad you got a job.'

[10]On the other hand, these observations seem to suggest that the unactuality requirement is a kind of felicity condition for utterances with desiderative or volitional predicates. If this were so, it should be anomalous or odd for someone to utter

(i) *María quiere que coloquemos sus zapatillas al lado del sillón.*
María wants us to put her slippers beside the armchair.

if the discourse participants are obviously aware that María's slippers are in fact already placed beside the armchair (for example if the conversation occurs as they observe the slippers there). However, contrary to what the unactuality requirement seems to imply, this utterance would be interpreted with no special effort or surprise on the part of the hearer in such a situation (Victoria Escandell, p.c.) The relevant interpretation would take the utterance as expressing the speaker's intention to explain why the slippers should be kept in the particular place mentioned. The relevance of the explanation is based on the assumption that the hearer probably expects the slippers to be kept elsewhere. What does seem to be a condition on the appropriate use of desiderative and volitional predicates, then, is that the complement proposition should represent either (a) a proposition that is not entailed in the discourse context, or (b), a proposition that the speaker believes the hearer is somehow surprised by, or which represents a state of affairs assumed to be contrary to (the hearer's) expectations.

These limitations on the appropriateness for the complement propositions of desiderative and volitional predicates can be otherwise stated as specifications regarding the propositional attitudes which they refer to. On the one hand, the attitude holder, A, may be interpreting a proposition that she entertains as a description of a possible future outcome to the present situation; in other words, the proposition which expresses the object of a volitional attitude is represented interpretively because it does not belong to A's belief-set: in (5), for instance, Jorge is attributed a representation which interpretively represents the possible state of affairs in which the employee carries his bags. The propositional complement represents a state of affairs that is distinct from reality, but logically related to the A's view of the situation referred to in the matrix clause as a possible outcome to it.

In conclusion, the connection between volitional predicates and the subjunctive as an interpretive use marker is related to the embedded contexts that the lexical semantics of such predicates create for the interpretation of their propositional complements. By virtue of the semantics of 'that'-clauses, as proposed by Bezuidenhout (2000), the embedded proposition constitutes an intepretive representation of the proposition attributed to the attitude holder, A; the semantics of the subjunctive, on the other hand, marks the content of A's attitude as interpretive representation of a proposition which is entertained as a possible outcome of the situation referred to in the matrix clause.

3.2 Metarepresentation and factive predicates

The use of the subjunctive in factive environments has often been referred to as *thematic* or *presuppositional subjunctive*. As mentioned in section 1, the subjunctive is selected in the argument clauses of factive emotive predicates in Spanish:[11]

(6) *María se ha alegrado mucho de que le hayan dado el premio.*
María CL has pleased much of that CL have (subj.) given the prize
'María was very glad that they have given him the prize.'

Predicates like *alegrarse* express an emotional reaction to the state of affairs denoted by their propositional arguments, and are known as "factive-emotives". Other examples of these include *lamentarse*, *quejarse*, *asustar*, *temer* (regret, complain, frighten, fear). It has been pointed out in studies that analyse mood as an indicator of assertion[12] that, contrary to what would be predicted in traditional analyses of the subjunctive as a mark of *irrealis* modality, the appearance of the subjunctive in these contexts cannot be ascribed to a lack of speaker commitment to the truth of the proposition, since these predicates require that the truth of their propositional arguments be taken for granted. In such contexts, this mood has a backgrounding effect, marking the argument proposition as secondary information, the theme, in contrast with the matrix proposition, which expresses the rheme or foregrounded information communicated by an utterance.[13] Gregory (2001) expresses this idea in terms of discourse context: the thematic subjunctive represents a type of "discourse anaphor", marking the proposition as referring to a propositional representation "that has been recently evoked or is somehow present in the discourse context".

[11]The same types of factive predicates select or can license the subjunctive in other Romance languages, such as Catalan and French.

[12]E.g. Bybee & Terrell (1990); Lunn (1992); Mejías-Bikandi (1994); Ahern & Leonetti (2004).

[13]As discussed in detail by Pérez Saldanya (1999); also related to the proposal put forth by Lunn (1992).

The subjunctive mood in these contexts, therefore, marks the proposition being reacted to, or evaluated, as "discourse-old" information.

In the previous section, the subjunctive as a mark of interpretive use was discussed in relation to an "unactuality requirement" present in the conditions for the appropriate evaluation of constructions with volitional predicates. As pointed out above, this requirement represents what could be described as an "anti-presupposition". But in thematic uses of the subjunctive, on the contrary, presupposition of the proposition is considered fundamental. The common element in both of these semantic environments that select the subjunctive in Spanish, then, can be described as restrictions that the matrix predicates place on the contextual assumptions that should be present in order for the complement proposition to be evaluated appropriately.

The analyses of the subjunctive as a mark of non-assertion, such as Bybee & Terrell (1990), suggest that this mood appears under factive-emotive predicates due to the contrast between the background information and the content being asserted. The speaker is expressing as the main point of the utterance her description of a subjective reaction – the main clause proposition – to the propositional argument.

Therefore, the propositional attitude information communicated by an utterance like (6) would generally consist of, firstly, the speaker's belief that María is pleased about someone having received the prize; furthermore, the fact that María is reacting to (or evaluating in some way) the state of affairs described by the argument proposition, and this presupposes, in turn, that María believes it is true. As regards the speaker, the presumption of optimal relevance would give the hearer grounds to assume that she is not interested in offering the information that a particular person was given the prize, but rather, in informing the hearer about María's reaction to the situation denoted by the argument proposition. The speaker's informative intention is centred, thus, on the matrix proposition, and its argument proposition is presented as given information.

In uses in which the subjunctive is grammatically selected it has been said that mood makes no contribution to the communicative content of the utterance (Borrego et al. 1989:6). But this fact does not contradict the proposal that mood encodes procedural meaning, which affects the inferential processing of the conceptual content of the proposition. When the subjunctive is grammatically selected, the semantic properties of the embedding predicate determine the interpretation of its argument clause in a more explicit way than the procedural indication expressed by mood. The conceptual content of volitional predicates restricts the interpretation of their argument propositions to such a degree that the inferential processes which the semantics of the subjunctive would affect are not carried out; the decoded semantic content is complete enough that the relevant interpretation of the argument proposition can be reached without further inferential processing. In the case of factive-emotive predicates, however, the semantic properties of the embedding context do not restrict the interpretation of the argument with the same regularity as occurs with volitionals.[14] Thus, we might ask whether factive-emotive predicates can truly be said to *select* the mood of their argument clauses.

[14]In Spanish, the use of the subjunctive in the propositional arguments of a number of factive-emotive predicates can be subject to variation (see Bolinger 1974; Bosque 1990:46; Lope Blanch 1990) when the speaker chooses to present the argument proposition assertively. In such cases, the factive-emotive predicates are also functioning as communication predicates (as described, for instance, by Borrego et al. 1989:103):

(i) *Se queja de que no le* {*tratan / traten*} *bien.*
CL he-complains of that not him treat (ind./subj.) well
'He complains that they don't treat (ind./subj.) him well.'

On the other hand, predicates like *alegrarse* (to be glad), which do require the subjunctive (see (6) above), *semantically* restrict the interpretation of their arguments as presuppositional. But just as the "anti-presupposition" imposed on the arguments of volitional predicates does not prevent us from using them to express factual propositions, we can use a "presuppositional" predicate without presupposing its argument.[15] For if we continue an utterance like that of (6) in the following way:

(6′) *María se ha alegrado mucho de que le hayan dado el premio…*
María CL has very glad of that CL have (subj.) given the prize…
¡Qué inocente!
what innocent
'María was very glad they gave him the prize… how innocent she is!'

it is doubtful that the embedded proposition would be interpreted as a representation whose truth the speaker takes for granted. On the contrary, if the utterance of (6′) were ended as indicated, the speaker's attitude towards the embedded proposition could be identified not only as one of disbelief, but even of mocking María for believing such things.

In sum, in order to explain the role of mood choice in interpretation, a clear distinction must be drawn between the semantic conditions that attitude predicates impose on the interpretation of their argument propositions, and the speaker's intentions and attitude towards the propositions she may refer to. In a sentence like (6), what is actually implicated is that the *attitude holder* presupposes the content of the argument clause. The speaker may or may not do so, and only the contextual assumptions can determine whether or not the speaker intends to express the content of the argument proposition as a previously accepted, or contextually accessible, factual assumption. The speaker may express her doubt regarding the truth of such a proposition in a continuation such as the one shown in (6′); otherwise, the content of the proposition may have been expressed in an utterance in the previous discourse, but the speaker might show her intention to present it as an echoic representation through a finger-curling gesture imitating quotation marks, or certain intonation, thus explicitly attributing its content to the point of view of another individual.

The role of the subjunctive, then, is linked to the semantic properties of factive-emotive predicates. The speaker's intentions regarding the identification of her attitude towards the embedded proposition may fall in with those semantic properties, or on the other hand, they may not: other things being equal, the interpretation would lead to identifying the argument propositions of these predicates as what the speaker intends to express as given information. Otherwise, based on the presumption of optimal relevance, we can assume that the speaker would choose another way to express the embedded proposition, such as:

The use of the indicative does not activate the assumption that the argument proposition represents a proposition that is already accessible in the communicative context, and leads to the conclusion that the speaker is presenting the propositional argument as new information. The occasional use of the indicative in complements of factive-emotive predicates is possible because the semantic properties of such predicates include more flexible conditions for the interpretation of their propositional arguments, in contrast with those of volitional and directive predicates, as discussed above.

[15]Thanks to an anonymous reviewer for pointing out the importance of this consideration.

(7) *Le han dado el premio a Ricky, y María se ha alegrado*
CL have (ind.) given the prize to Ricky, and María CL has pleased
mucho de ello.
much of it
'They have given the prize to Ricky, and María is very glad about that.'

This is not to say, nonetheless, that utterance (6) could never be used for the purpose of informing the hearer of the propositional content of its argument clause, but rather that such an informative intention would be more difficult to recognise: it would create a larger processing effort for the hearer. This increase in processing effort would lead, again based on the presumption of optimal relevance, to an expectation of some extra implicatures that would not have been derived from a straightforward assertion of the contents of the propositional argument. So in a case where the argument proposition is controversial, an utterance such as (6) would give the impression that the speaker's intention is to create certain contextual effects based on, for instance, the idea that it is being used as an attributive interpretation, and that the speaker intends to make an ironic comment, to refer to some state of affairs metaphorically, etc.

In sum, the selection of the subjunctive in the arguments of factive-emotive predicates is motivated by the fact that they are used to express a reaction to a proposition that is being presented as a contextually accessible assumption. In the previous section, it was shown that volitional and directive predicates create embedded contexts in which the argument proposition metarepresents the attitude holder's representation of a possible outcome to the situation referred to in the matrix. In this section, it has been observed that factive-emotive predicates create embedded contexts in which their argument propositions represent interpretations of propositions derivable from the communicative context, e.g. from a previous utterance, or from the situation itself. The contribution made by the use of the subjunctive is stable in all of these cases; the semantic properties of the different kinds of subordinating predicates determine the relation between the propositional representation being used interpretively, on the one hand, and the contextual assumptions accessed in the inferential process of identifying the relevant interpretation of the utterance, on the other.

In accordance with existing studies on the semantics of the subjunctive and of subordinating predicates, the present proposal relates the lexical selection of the subjunctive to the characteristics of the embedded contexts created by propositional attitude predicates. The contribution made by mood in such cases fulfils a minor communicative function, since the conceptual semantics of the embedding predicates specify, in a more explicit way, restrictions on the interpretation of the embedded propositions which overlap with the procedural indications expressed by verbal mood. But, as stated above, the procedural information grammaticalized in the subjunctive is linked to a much broader communicative phenomenon. In the next section, I discuss the linguistic contexts that make a choice available between the indicative and the subjunctive, in which the effects of mood choice on interpretation can be clearly distinguished from the those of the semantics of subordinating predicates.

4 Operator licensing

In the previous section, it was pointed out that not all of the factive predicates select the subjunctive. As mentioned above, all of the "epistemic" factives require indicative propositional arguments, whereas those that express a reaction, or an evaluation of their argument propositions, select the subjunctive. This distinction was related, in turn, to the fact that factive-emotive predicates entail that the propositions embedded under them function as "anaphoric propositions", used to refer to some representation that has been evoked or is already present in the discourse context. On the other hand, through the proposition expressed in the matrix clause, these propositions also metarepresent the content of the proposition which the attitude holder is being said to react to or evaluate. This "doubly-anaphoric" function is not necessarily associated, however, with the propositions embedded under epistemic predicates.

Epistemic predicates in general (predicates of knowledge, acquisition of knowledge, perception and belief), in affirmative utterances, require the indicative in their argument propositions. However, as mentioned in the introduction, another noteworthy characteristic of epistemic predicates is that the presence of negative and interrogative operators can license the appearance of the subjunctive in their argument propositions. Thus, in negative and interrogative constructions, the speaker can choose the mood of the embedded clause, just as is the case with "double selection" predicates (verbs of saying and inference; see Ahern 2005). In the present section, I will discuss why this is possible, and also show that the effects of mood choice on interpretation in these constructions depend on a number of factors.

In negative or interrogative constructions with epistemic predicates, the choice of mood is related to the point of view being expressed. Depending on the mood chosen, the embedded proposition is interpreted either as being expressed from the point of view of the subject of the main clause, or from that of some other contextually salient individual (usually, the speaker). In this particular type of construction, the grammaticality of mood choice is a matter of degree, certain choices being more or less "marked" depending on the embedding predicate chosen by the speaker. If, as suggested by Horn (1989:324–5), the concepts represented by epistemic predicates are situated on a scale according to the degree of certainty, likelihood, or probability they are associated with, the effects of mood in these contexts can be seen as following a logical pattern. In other words, epistemic predicates lexicalize a mental classification of the reliability of the information represented in the propositions embedded under them. The information regarded as more reliable is integrated into the world view of the speaker to a greater degree that the assumptions which proceed from less reliable sources. In the examples below, the choice of the indicative in the embedded propositions is less marked under predicates that can be associated with a higher degree of reliability of the information represented in the proposition. The subjunctive, by contrast, is less marked under predicates expressing lower degrees of reliability.

(8) a. *Juan sabe que María tiene coche.*
Juan knows that María has (ind.) a car.

b. *¿Sabe Juan que María {tiene / ??tenga} coche?*
Does Juan know that María has (ind./subj.) a car?

c. *Juan no sabe que María {tiene / ??tenga} coche.*
Juan doesn't know that María has (ind./subj.) a car.

(9) a. *Juan se ha enterado que María tiene coche. (Juan has found out that María…)*
b. *¿Se ha enterado Juan que María {tiene / ??tenga} coche?*
c. *Juan no se ha enterado que María {tiene / ?tenga} coche.*

(10) a. *Juan ha visto/notado que María tiene coche. (Juan has seen/noticed that…)*
b. *¿Ha visto Juan que María {tiene / tenga} coche?*
c. *Juan no ha visto que María {tiene / tenga} coche.*

(11) a. *Juan cree/piensa que María tiene coche. (Juan believes/thinks that…)*
b. *¿Cree Juan que María {tiene / tenga} coche?*
c. *Juan no cree que María {?tiene / tenga} coche.*

Mood choice in these examples is more or less marked, as mentioned above, depending on the embedding predicate. In other words, the dependence of mood choice on particular discourse conditions varies in degree. For instance, in (8), the use of the subjunctive leads to an interpretation in which the embedded proposition is presented as an interpretive use. The inference that follows from this is that the speaker dissociates herself from the content being communicated in the complement proposition; however, the speaker's decision to embed the proposition under the predicate *saber* (to know) contrasts with such an attitude. The acceptability of the subjunctive in (8c) depends heavily on the availability in the discourse context of a source that the embedded proposition can be attributed to, due to the contrast between the implications of the speaker's choice to dissociate herself from the content by marking it as an interpretive use while at the same time embedding it under a verb of knowledge.

As for predicates which express speaker's classification of the information in the argument proposition as having a lower degree of reliability, such as verbs of thought, as in (11), the choice of the subjunctive does not imply such sharp contrasts in the attitudes being communicated. In example (11c), the subjunctive is the unmarked mood, since the speaker is attributing disbelief in the proposition to the subject of *creer* (believe), Juan. The information that the embedded proposition is expressed as attributive interpretive use, conveyed by the choice of the subjunctive, creates no contradictory inferential effects. The use of the indicative, on the other hand, leads to a polyphonic reading in this case because it represents the speaker's choice *not* to mark the embedded proposition as an attributive interpretation of the subject's (Juan's) representation, and this contrasts with what is expressed by the matrix proposition. These facts will be discussed in more detail below. In any case, the type of information expressed by mood in these constructions can be said to relate to the point of view adopted: the indicative generally leads the hearer to associate the proposition with the speaker's point of view, whereas the subjunctive signals that it is expressed from the point of view of someone other than the speaker, generally the subject of the propositional attitude predicate.

In sum, an intricate pattern can be observed in the effects of the interaction of the semantic properties of epistemic predicates and predicates of saying, sentential operators, and mood choice. Mood choice can express either information on the type of speech act being reported, or on the point of view being adopted. In declarative or assertive utterances, mood choice is available under verbs of saying, and expresses speech act information, but in the presence of negative or interrogative operators, it can express information on the point of view being adopted. In negative and interrogative utterances, mood choice is available under all of the epistemic predicates, and expresses information on point of view.

A few references can be found in the literature on mood in Spanish that discuss how, under these predicates, mood interacts with contextual assumptions and discourse context. For instance, the verb *creer* (believe) has received considerable attention in previous studies on mood. As pointed out above, this verb can appear in an interrogative sentence with a propositional argument in either the indicative or the subjunctive. The effect on the interpretation of the utterance, however, has not been a matter of agreement: although many authors consider the mood of the argument proposition to be related to the speaker's degree of certainty regarding the truth of the proposition, this does not seem to be necessarily so.

Traditionally, it is said that the choice of moods in interrogative contexts under *creer* and the other epistemic predicates depends on the speaker's epistemic attitude; Haverkate (2002:78), for instance, considers that the use of the subjunctive in propositions embedded under epistemic predicates "triggers a *potentialis* interpretation", and thus marks a "lower degree of truthfunctional information". Nonetheless, the same author points out that in "certain polyphonous contexts", which in actual fact I think represent the type of contexts that are involved in most cases of language use – i.e. typical discourse situations – *the indicative*, and not the subjunctive, can be used to express the speaker's total scepticism. For instance he cites Bell's (1990:434) example:

(12) *¿Precisamente cree Ud. que hay monstruos con cuatro cabezas*
Precisely believe you that there-are (ind.) monsters with four heads
en el caribe?
in the Caribbean
'Do you actually believe that there are (ind.) monsters with four heads in the Caribbean?'

Bell pointed out that the subjunctive mood in this utterance would be ungrammatical or at least very odd.[16] The effect of the indicative mood in this sentential context leads to a quotative interpretation of the propositional argument, whereas the subjunctive would not do so. And the same effect can be observed when the indicative is used in propositional arguments under the negation of *creer*. The "grammaticality" of the choice of the indicative or the subjunctive is affected, in cases like this one, by the degree in which the propositional content of the argument is "believable" in a given context (and as can be seen, the correlation between the subjunctive and *irrealis* modality is, once again, invalidated).

To return to the continuum represented by the predicates under consideration, as mentioned above, the higher the degree of certainty expressed by the embedding predicates the less dependent on discourse conditions is the use of the indicative in the argument clause, whilst the subjunctive becomes more so. In other words, depending on the degree of certainty expressed by the lexical semantics of the embedding predicate, either the indicative or the subjunctive tend to lead to echoic interpretations (what Haverkate 2002 refers to as polyphonic readings), which are more or less dependent on the previous discourse or the contextual assumptions available – in particular, on the accessibility of the proposition within the context, either in a previous utterance or as a manifest assumption – in order to receive a natural interpretation.[17]

This partial correspondence between the different degrees of certainty associated with embedding predicates and the effect of mood choice in their arguments follows the tendency as

[16]Although in standard European Spanish this is so, in other dialects the subjunctive is acceptable in the same construction, for instance in Mexican Spanish (Gabriela Caballero, p.c.).

[17]Echoic utterances have been studied extensively within the relevance-theoretical framework; see for instance Wilson (2000); Carston (1996, 2002); Escandell-Vidal (2002).

shown in Figure 2. The choice of a predicate that expresses a high degree of reliability, even when used to report the knowledge attributed to another individual, will normally correspond to a speaker attitude of belief towards the propositional argument. The expression of this argument as an interpretive metarepresentation, by choosing to mark it with the subjunctive, introduces two contradictory elements into the semantic representation of the utterance: on the one hand, the speaker's choice of embedding predicate implies a positive epistemic attitude, i.e. a high degree of reliability; and on the other, the implications derivable from expressing its argument in the form of an interpretive representation, pointing towards the conclusion that the speaker is unwilling or unable to express the proposition as forming part of the informative content of the utterance.

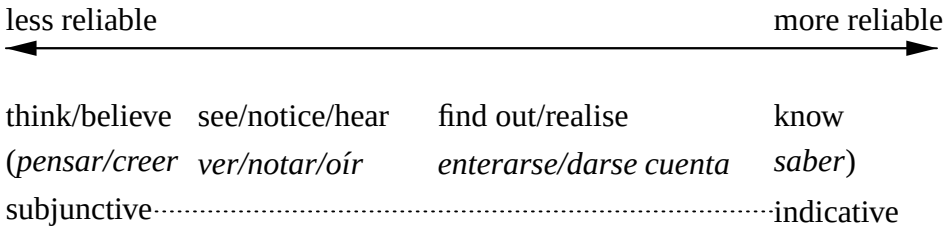

Figure 2: Conceptual scale of epistemic predicates

Nonetheless, it should be noted that when a speaker uses a construction such as those illustrated in (8–11) above, we are more likely to correctly identify the *speaker*'s attitude towards the embedded proposition than the "attitude holder's". For we can report a statement such as (13) in a number of ways, as in (14a–g).

(13) It's going to rain.

(14) a. Jack knew it was going to rain.
b. Jack supposed it was going to rain.
c. Jack thought it was going to rain.
d. Jack was sure it was going to rain.
e. Jack believed it was going to rain.
f. Jack noticed it was going to rain.
g. Jack felt it was going to rain.

Whether we choose to report Jack's affirmation by using (14a), or any of (14b–g), depends almost entirely on our own point of view regarding the truth of the statement, the attitude with which we assume that Jack may have entertained the content expressed, or how he came to believe it.

In sentences such as those in (8–11), however, the role of mood choice also influences the interpretation of the speaker's attitude. On the one hand, the speaker may choose to express the content of Juan's attitude as knowledge, using a verb like *saber* (know), which might imply that it forms part of the speaker's belief-set. But on the other, the choice to use the subjunctive leads to the conclusion that the embedded proposition is being presented as an interpretive representation, which activates an inferential process in order to identify a source for the "original" representation. The semantics of *saber* eliminate the possibility reading illustrated in Figure 1;

the interpretation would require the incorporation of contextual assumptions, leading to an echoic interpretation if the contents of the embedded proposition.

Thus, when reporting another individual's lack of belief/knowledge/etc., the speaker is introducing, by way of the semantics of the matrix proposition, an attributive representation. In this respect, the lexical semantics of epistemic predicates defines their argument propositions as interpretive representations. The indicative in these constructions creates opacity for the effect of the negative or interrogative operator, bringing about an external interpretation of these operators. The scope of the operator is sensitive to the scope of the metarepresentation: by escaping the scope, the propositional representation which the argument proposition is interpreting (P') will be understood to be attributable to an individual different from the subject of the matrix, i.e., the agent of the epistemic predicate is not the agent that the propositional argument is attributed to.

The choice of a predicate higher up on the reliability scale corresponds, thus, to the speaker's likelihood to use its argument proposition to (meta)represent a belief of her own. When a predicate represents a lesser degree of reliability, if it is used to report another individual's propositional attitude, the speaker is more likely to attribute its propositional argument to the individual whose (dis-)belief is being reported. The use of the subjunctive will have the effect of encouraging the hearer to consider the propositional contents to be an interpretation of a representation being attributed to the matrix subject. The speaker does not suspend the metarepresentational domain explicitly introduced by the matrix proposition by using the indicative, and therefore gives no evidence of an intention that the argument proposition should be attributed to any other individual besides the one explicitly referred to in the matrix.

If the speaker chooses the indicative, the metarepresentational interpretation is more difficult to access. The indicative does not communicate an instruction to interpret the proposition as an interpretive representation, in contrast to what is communicated by the lexical semantics of the matrix proposition. In such cases, the information communicated consists of, e.g.:
a) *Juan no cree…* explicitly communicates that the argument represents information regarding Juan's opinion
b) …*que María tiene coche* the indicative mood forces the proposition to be interpreted outside of the scope of the operator, cancelling the assumption that the proposition is an attributive representation of Juan's lack of knowledge/belief. The "default" mechanism for identifying the individual whose representation is being interpreted is blocked. The hearer must identify some other source to attribute the representation to. The discourse context may provide a means to identify the source (e.g. a previous utterance which communicated the same proposition, or the proposition represents a contextually manifest assumption), or in the absence of this possibility, the speaker will be assumed to be the source and to be establishing a contrast between her own beliefs and Juan's opinion, albeit in a rather indirect way.[18]

Returning to example (12), we are now in a position to explain why a proposition that is *less* believable is more likely to be expressed in the indicative in this type of constructions. The speaker's choice to use the indicative in (12), and to thereby suspend the metarepresentational

[18] An utterance such as:

(i) *María tiene coche, pero Juan no se lo cree.*
María has a car, but Juan doesn't believe it.

would represent a way to express such contents that under most circumstances would be more relevant than an utterance such as *Juan no cree que María tiene coche.*

domain induced by the matrix proposition – which would otherwise be a means for ascribing the argument proposition to the hearer's (i.e. the matrix subject's) beliefs – leaves the hearer with the responsibility of choosing the source to which the proposition can be attributed. Since the argument proposition, in most contexts, would be considered to represent a highly implausible state of affairs, the interpretation is likely to be that the speaker attributes it to some other individual, hence the polyphonic effect.

However, when a predicate from higher up on the reliability scale is chosen, the interpretation functions in a different way. The choice of a predicate of knowledge or acquisition of knowledge makes it less acceptable for the speaker to choose to represent its argument as an attributive representation, thus the appearance of the subjunctive is more restricted, and the indicative is the unmarked choice. This occurs because choosing to describe P as knowledge is contradictory with choosing to express P as being exclusively attributable to another(/other) individual(s) (the matrix subject). The semantics of these predicates determine that normally the speaker must be willing to share the responsibility for the content expressed by the argument, and therefore not use the subjunctive, which would reflect a lack of such willingness.

In negative and interrogative constructions involving predicates of knowledge or acquisition of knowledge, then, the indicative is the unmarked mood because the semantics of these predicates itself is more likely to create the opacity that resists against the negative or interrogative operator scope. These predicates, by virtue of the fact that they characterise their argument propositions as factual knowledge, create an opaque domain in which the choice to use the subjunctive, and to thereby lead to the conclusion that their arguments are attributive representations, forces the hearer to deal with some contradictory assumptions in the interpretation process. The contradictions are likely to lead to a certain amount of extra processing effort, thus reducing the probability that the utterance may achieve optimal relevance. The fact that the subjunctive represents the "marked" mood under these predicates is a reflection of this extra processing effort related to the conflicting inferences derived from the combination of the subordinated context triggered by the choice of embedding predicate and the use of the subjunctive mood.

However, the "markedness" of the subjunctive under predicates of knowledge, or associated with higher degrees of reliability, is relative too. As seen in the discussion of (8) above, the subjunctive is generally strongly marked in such contexts. But, as shown regarding (18), the acceptability of the subjunctive depends on certain properties of the embedded proposition, specifically, the relation it holds with the contextual assumptions activated by the conceptual content of the proposition. For instance, although (8c) (*Juan no sabe que María tenga coche.*) is odd, or even ungrammatical according to many Spanish speakers, if the embedded proposition brings up a controversial issue, the sentence becomes perfectly acceptable:

(15) *Juan no sabe que María tenga un amante.*
Juan not know that María has (subj.) a lover
'Juan does not know that María has a lover.'

This difference in acceptability is related to our pragmatic knowledge about the contexts in which the utterances would be used. The every-day kind of conversation that might bring up the question of whether María has a car, as in (8c), would not provide any motivation for presenting such a matter as an interpretive representation, or for the speaker to choose to present it as such while embedding it under a predicate of knowledge. However, when it comes to discussing a proposition whose truth would bring about a number of important consequences, the more elaborate

interaction of assumptions brought into the interpretation process by the subjunctive is perfectly appropriate. In other words, the interpretive use of the complement in (8d) is not perceived as strange because it expresses a proposition that is easily identified as what the speaker intends to represent as being a contextual assumption, a proposition that the she may not wish to affirm, but treats as present in the context, probably as what is suspected either by the speaker herself or by another individual. And finally, as mentioned in the introduction, the use of the past tense also attenuates the conflicting characteristics that make utterances like (16) appear more marked:

(16) *Juan no sabía que María tuviese coche.*
Juan did not know that María had (subj.) a car.

The fact that the degree of reliability had in the past does not necessarily correspond to what the speaker may wish to present as factual from the present perspective is easily understood as a result of our pragmatic knowledge that circumstances change over time, and need not be taken to create conflicting implicatures.

Returning now to the general proposal presented so far in this section, it is based on the claim that the interaction of mood in Spanish with the predicates and operators discussed above is a result of the scalar organisation of the concepts associated with these predicates, the degree of speaker commitment related to each predicate type, and the particular point of view that speakers intend the proposition to be interpreted from. It has been shown that the pragmatic mechanisms involved in the interpretation of utterances that include these particular constructions are not simple; but the features of point of view, speaker commitment, and epistemological concepts can be observed to interact in similar ways regardless of the particular language under consideration.

In fact, precisely the predicates under discussion in this section, predicates of saying and epistemic predicates, have been observed to create particular semantic and pragmatic effects across a large variety of languages. As pointed out by Speas (2004: see also references therein), predicates of speech, thought, knowledge and perception reflect the concepts that are involved in creating *evidential* and *logophoric* contexts in the languages that encode these types of meaning morphologically. In other words, regarding logophoricity, in the languages that possess logophoric pronouns – a particular kind of pronouns that "are used to refer to an individual whose viewpoint, words or thoughts are being reported" (Speas 2004:6) – the sentential contexts which trigger their appearance are the argument clauses of subordinating predicates of saying, thought, knowledge and perception.

As for the cross-linguistic study of evidentiality, the morphological marking of the speaker's source for the information expressed in an utterance, Speas points out that exactly the types of semantic contexts that legitimate logophoric pronouns ("logophoric contexts" Culy 1994) correlate with the four basic categories of evidentiality that are encoded in languages possessing evidential morphology: reported evidence (hearsay) – verbs of saying; indirect evidence – verbs of thought; direct evidence – verbs of knowledge, and personal experience – verbs of perception.

These cross-linguistic data are relevant to the analysis being proposed here in the sense that the notion of interpretive use, in particular attributive interpretive use, represents a communicative description of the function of evidential and logophoric categories. In the case of evidentiality, the propositions in the scope of evidential modality can be described as attributive interpretations of the content being attributed to the particular source indicated in each category of evidentiality. And regarding logophoricity, the content that is expressed within logophoric con-

texts is also analysable as being interpretive since the domains which license logophoric pronouns are considered to represent a point of view which is "external" to the speaker of the utterance.[19]

To recapitulate, it has been pointed out that a reduced group of predicates represent exactly the type of semantic content that triggers logophoric contexts, and is encoded in evidential morphology, across many languages around the world. These predicates are also precisely the ones that in Spanish show the following particular characteristics:

- they require indicative complements in affirmative constructions, but the presence of negative or interrogative operators license the use of the subjunctive in their complements;
- the choice of mood in these cases creates polyphonic effects, or in other words, expresses information on the point of view being adopted. This is because the mood chosen determines whether the speaker chooses to attribute the complement proposition exclusively to the subject of the embedding verb, by using the subjunctive, or, to suspend the metarepresentational context induced by the main clause proposition, by using the indicative.

The cross-linguistic data regarding the effects of the predicates under consideration, as well as the interpretative effects of mood choice discussed in this section, represent strong arguments in favour of an analysis of the subjunctive that can relate it to the notion of interpretive use. Both the effects that stem from the choice of mood in the contexts under consideration, and the fact that the predicates in question have been independently pointed out to represent the types of contexts that, in language after language, trigger interpretive use, show that the analysis proposed is based on a solid foundation.

5 Concluding remarks

As can be observed, the task of untangling the semantic content of verbal mood requires us to deal with many other factors, such as the semantics of embedding predicates, the explicit and implicit communication of propositional attitudes, and the contextual assumptions present in discourse situations. For this reason, a theory that provides a psychologically realistic model of the semantics-pragmatics interface, such as RT, is particularly appropriate, as I hope to have shown, for elaborating an analysis of mood that can explain the interaction of these factors while maintaining each one within its appropriate level of representation.

The proposal that the subjunctive is a procedural indicator of the interpretive use of a proposition, as stated in the introduction, is intended to build on the time-tested definition of the subjunctive as marking non-assertion. In contrast with the non-assertion hypothesis, the idea of a grammatical mark of interpretive use is a positive characterisation, offering more information about what speakers *are* doing when they express a non-asserted proposition. Another argument in favour of this hypothesis is the fact that interpretive-use markers have been found in many languages, in contrast to specific marks for non-assertion.

Although the variety of uses and linguistic triggers for the subjunctive do not follow a regular pattern, the interpretive use marker represents abstract information on the speaker's intention about the direction of the inferential processes involved in identifying illocutionary and propositional attitude information. The combination of the abstract procedural information with the semantics of the embedding predicate, and in other uses, with contextual assumptions, determines

[19] See also Schlenker's (2003) discussion on the parallelisms between logoporicity and the Konjunktiv I mood in German.

the different types of effects that verbal mood has on the overall interpretation. The metarepresentational hypothesis is, I hope to have shown, particularly appropriate in cases where mood choice is related to polyphonic effects, such as under epistemics in negative and interrogative environments. On the other hand, in the cases of mood selection, although the proposal requires further development, it seems that the interaction between the characteristics determined by propositional attitude predicates regarding the embedded contexts they create and the contextual assumptions involved in the interpretation process can be analysed appropriately by considering the function of the subjunctive to be a marker of a more general communicative phenomenon such as that of interpretive use.

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FUTURITY IN DEFAULT SEMANTICS

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1 The modality of *will*: An argument for default interpretations*

This paper contributes to the ongoing debate concerning the status of the English *will* as a marker of (i) tense, (ii) modality, or (iii) ambiguous between the two (see e.g. Fleischman 1982; Enç 1996; Werth 1997; Ludlow 1999). In particular, I concentrate on clearly modal uses of *will* as in (1) and (2) (epistemic and dispositional necessity respectively), as opposed to (3) where *will* has future time reference.

(1) Mary will be in the opera now.

(2) Mary will sometimes go to the opera in her tracksuit.

(3) Mary will go to the opera tomorrow night.

I demonstrate that when we adopt an approach to temporality based on event semantics (e.g. Parsons 1990; Kamp & Reyle 1993; Pratt & Francez 2001), the classification of *will* as modal turns out to be the most satisfactory solution of the three listed above. For this purpose I combine the analysis proposed in Discourse Representation Theory (henceforth: DRT, Kamp & Reyle 1993) with the theory of default interpretations (Jaszczolt 1999a,b, 2002b) and use the properties of (i) the intentionality of mental states, and their pragmatic equivalent of (ii) communicative, informative and referential intentions in communication in order to show that the degrees of intentions involved result in different interpretations of *will*. The strongest referential intention directed at the eventuality (state, event or process) results in the strongest commitment to the communicated eventuality and by the same token in the 'weakest degree of modality'.

The discussion of the properties of *will* is supplemented with a discussion of the semantic category of futurity. Sentence (3) is juxtaposed with expressions of futurity that use futurative progressive and so-called 'tenseless future' as in (4) and (5) respectively.

(4) Mary is going to the opera tomorrow night.

(5) Mary goes to the opera tomorrow night.

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It is demonstrated that the three readings of *will* differ as to the degree of modality and can be given one overarching semantic representation. Since future *will* is best accounted for with reference to possible worlds (see e.g. Parsons 2002, 2003), it is not qualitatively different from modal *will*. Without invoking the world-time units, the purely future *will* in (3) also turns out as modal since it exhibits affinities with (1) and (2) on one hand, and (4) and (5) on the other, that are best explained by a scale of epistemic modality. In other words, the gradation of intentions strongly suggests that *will* is modal. Instead of the ambiguity/temporality/modality trilemma, there is a gradation of the, so to speak, strength of intending the eventuality that results in various degrees of modal meaning communicated by *will*. By the 'strength of intending' I mean the degree to which the speaker's mental state is about a certain identifiable object, and by the 'degrees of modal meaning' I understand the degree of the speaker's detachment from the proposition that expresses a certain state of affairs or a certain event. I corroborate this argument by placing *will* in the framework proposed in Grice (2001). According to Grice's Equivocality Thesis, alethic and deontic modalities are univocal, derived from one conceptual core of *acceptability*. Finally, I propose that Grice's acceptability can be introduced as a modal operator (ACC) to DRT, replacing the current treatment of *will* that relies on representing tenses.

The structure of the paper is as follows. Section 2 presents a background for analysing *will* as a modal expression. Section 3 presents the principles of Default Semantics in which my analysis of futurity and modality of *will* is performed. In Section 4 I propose to view discourse representation structures (henceforth: DRSs) of DRT as merger representations of Default Semantics. Section 5 constitutes the climax of the discussion and presents an analysis of *will*, as well as an analysis of futurity in general, as a type of modality. The analysis is performed in terms of Default Semantics, combined with the resources of DRT and Grice's Equivocality Thesis.

2 The composition of *will*

In *De Interpretatione*, Aristotle classifies future with modals. While propositions about the present and the past must be true or false, with respect to future events he talks about 'potentiality in contrary directions' which gives rise to corresponding affirmation and denial (Aristotle, in 1928:16a–23b). Prior puts forward a conjecture that we might try to treat past and future differently, 'with one type of solution for future-existers and a different one for past-existers' (1967:174). In a widely acknowledged paper, Enç (1987) demonstrates that *will* and its temporal sense patterns with modals, while past and present are 'true tenses'. On this account, past and present are tenses and are to be regarded as referential expressions standing for intervals. They are not operators but temporal arguments of the verb – a standpoint that is called in the literature neo-Reichenbachian (Hornstein 1990:157)[1]. Similarly, Ogihara (1996) adopts the standpoint that verbs have argument places for temporal terms. *Will* is a modal with a future reference. Following Abusch (1988), he analyses *will* as *Pres*+*woll*, and in particular Pres[woll[V]] (Abusch 1988:9)[2], where *woll* is the English future auxiliary, neutral as to tense, that is realised as *will* or *would*. *Pres*+*woll* accounts for the futurity of the embedded *is* in (6) and for the 'double access' of (7):

[1]See also Hornstein's (1990:168) account of tenses as adverbs which allows for accounting for the locality restrictions necessary for the sequence of tense phenomena.

[2]This is a development of Ladusaw's (1977:97) analysis of auxiliary as Aux → Tense(Modal) with the semantics λp [Tense'[$^\wedge$Modal'(p)]].

(6) Next year, John will claim that Mary is his wife.

(7) Bill sought a man who will be leaving.

(from Ogihara 1996:123, 178). While in (6) *is* is interpreted as future because it matches in tense with *will*, in (7) two readings are available, on one of which *will* refers to a time prior to the time of utterance. Ogihara's relative tense theory, where tense morphemes are embedded in structurally higher tenses, allows for this explanation. So, while it is possible to hold that tenses are not operators and are not a species of modality (see e.g. Higginbotham 2001; Hornstein 1990), the term 'tense' has to acquire an intra-theoretical specificity there.

In what follows, I shall adhere to the operator analysis as it best captures the interrelations between (1)–(3) and (3)–(5) and is more methodologically parsimonious in being akin to the way modals are rendered. The problems with the sequence of tense phenomena, standardly brought in as an argument against the operator analysis, will obtain a solution by employing eventualities and relations between eventualities in the DRT-based Default Semantics. The merger representations (reanalysed DRSs) allow for expressing such interrelations by incorporating the earlier-than/later-than devices.[3] Since my DRSs are no longer derived from syntax but rather rely on a variety of contextual clues for temporal information, they capture the shifts of the temporal deictic centre. The working of such merger representations is demonstrated and employed in Section 5.2.

3 Principles of Default Semantics

3.1 Intentionality and the DI principle

Evidence and theoretical arguments in support of the view that futurity is modality are as yet very fragmented. Some of these views are embedded in a more radical view that time in general is just modality, others distinguish qualitatively between the past and present on one hand, and the future on the other. Just as for Parsons '[t]ensed properties are dispositional properties' (2002:18) and for Ludlow (1999:157) future is probability and possibility, it will now be argued that in Default Semantics the future comes with degrees of probability, commitment, or acceptability of a proposition. These characteristics are definitional of futurity and hence also apply to the analysis of the English *will*. Default Semantics will provide a uniform theory to unite extant evidence.

The main claim of Default Semantics is that utterances come with default interpretations. The dominant view in recent semantics and pragmatics is that in order to explain multiple readings of, let us say, propositional attitude sentences, sentences with sentential conjunction *and*, or negation, we have to postulate that semantic representation is underspecified as to some aspects of meaning, and further pragmatic processes in the form of (i) the developments of the logical form or explicature (Relevance theory) or (ii) implicatures (neo-Griceans) produce one exact reading.[4] In contrast to this view, the theory of Default Semantics contains only one level of representation, derived from the structure and properties of mental states. The general picture is this. People have various mental states, such as believing, doubting, fearing, knowing. Some of these

[3]See McTaggart (1908); Reichenbach (1948).

[4]The literature on this subject is vast and is growing fast. For seminal references see Jaszczolt (2002b, forthcoming); Levinson (2000), and Carston (2002).

states, like for example the ones just enumerated, necessarily have an object. In other words, they are intentional. Intentionality is a property of mental states that has proved very important since medieval philosophy, through $19/20^{th}$ century phenomenology and current discussions of the workings of speech acts (see Jaszczolt 1999a,b, 2002b for references). It means directedness, being 'about' an object – be it real object, mental object, or an ontologically unspecified eventuality, depending on the particular view or a particular mental state. Now, language is one of the possible vehicles of mental states, and the most important one. The properties that pertain to thoughts, beliefs, etc. will then also hold of linguistic expressions associated with them. On the level of linguistic expressions, this property of intentionality is realised as a property of an utterance's coming with intentions. In particular, the speaker is assumed by the addressee to intend to communicate a message through this utterance, and derivatively to inform about something and to refer to an object or eventuality.

According to (Searle 1983:27–28), intentionality is 'inherited' by speech acts. The mind imposes intentionality on linguistic expressions: utterances have *derived* intentionality, while beliefs have *intrinsic* intentionality. According to Default Semantics (Jaszczolt 1999b), there is no double level of intentionality. Instead, it suffices to say that mental states and their vehicles, including language, share the property of intentionality because the vehicles of thought are constitutive parts of mental states. Be that as it may, what is crucial to our current purpose is that there is intentionality and that it allows for degrees. In other words, intentionality can be stronger or weaker. A mental state of the speaker can be either about the identifiable object, or about some imagined but not necessarily identifiable object, or about whatever fits the name or description. To use another metaphor, it can 'hit the object' to various degrees of success. For example, reports on people's beliefs or other propositional attitudes can be *de re*, about a particular, known individual and come with strong intentionality, or they can be *de dicto*, about the proposition as a whole, whoever its subject might be. In the latter case intentionality is weaker. Just as intentionality allows for degrees, so do its realizations in the forms of intentions in communication. There are various degrees to which the speaker succeeds in referring to an object or communicating a statement. I have discussed and supported this view by various examples elsewhere (e.g. Jaszczolt 1997, 1999a,b, 2000a,b, 2002b,a, forthcoming) and will now refer to this statement as to an established principle called the principle of Degrees of Intentions (DI):

DI: Intentions come in various strengths, i.e. they allow for degrees.

Now, let us see how this theory applies to expressions of temporality. In the case of the English *will*, we have three possible standpoints as far as its meaning is concerned: (i) it expresses future tense (and tense is not subsumed under modality); (ii) it expresses modality; and (iii) it is ambiguous between tense and modal senses. The ambiguity position seems to be a dispreferred option by the methodological principle of parsimony called by Grice (1978) Modified Occam's Razor: *Senses (linguistic meanings) are not to be multiplied beyond necessity*. It seems that if we can provide an explanatorily adequate unitary analysis, this analysis is to be preferred. For Grice and neo-Griceans, this principle necessitates relegating some part of the meaning of utterances to the status of implicatures. For relevance theorists, it necessitates embellishments of the logical form to the status of an explicature. Related views are ample and need not be enumerated.[5] The choice between (i) and (ii) is more contentious. There are scattered and partial arguments

[5]See e.g. Jaszczolt 2002b:Chapters 10–11.

in support of the view that time should be subsumed under modality[6]. On the other hand, even if time is not modality, there are independent arguments in favour of the view that the future is qualitatively different from the present and the past and, contrary to the present and the past, futurity is modal. In other words, there are two independent sets of arguments in favour of *will* being modal.[7] But then even if it is normally modal, the modal meaning subsumes temporality in that whatever the future is, objective or subjective time is a way of thinking about it. So, modality subsumes time. Communicating temporality by means of *will* can be intended very strongly, less strongly, or to various other degrees culminating with very weak 'temporality' intention. If we accept this gradation of intentions, then Default Semantics renders this choice between (i) and (ii) unnecessary. Instead, various degrees of intentions correspond to various interpretations and neither ambiguity nor underspecification ensues. In order to develop this approach, we need two more principles of Default Semantics: the Parsimony of Levels and the Primary Intention.

3.2 The PoL and merger representations

In addition to degrees of intentions, Default Semantics adheres to a principle of parsimony with respect to the number of proposed levels of meaning. The original semantic representation (logical form) is the output of the compositional process of meaning construction and combines information coming from sentence structure and individual concepts. This representation is frequently in need of further enrichment before it can count as a faithful representation of the intended meaning.[8] Sometimes, like in the case of metaphors, it is also in need of further adjustment of some concepts (Carston 2002). However, this does not yet mean that there is a need in our theory for such a level of underspecified representation. As we know from DI, utterances come with different strengths of intentions. This degree of intending is correlated with the strength of intentionality of the corresponding mental state. The information from this degree of intentionality merges with the information from compositionality (i.e. with the logical form) and produces a complete propositional representation. This economy of levels of meaning is summarised in the principle of the Parsimony of Levels (PoL):

PoL: Levels of senses are not to be multiplied beyond necessity.

So, instead of adopting the underspecified semantic representation and the fully developed propositional representation, we have a more economical alternative of one meaningful representation to which the properties of the linguistic expression and the properties of the underlying mental state contribute, as it were, on an equal footing. In other words, meaning is compositional, but more fundamentally, it is also a result of having a thought, a meaningful mental state. So, intentionality is even more basic to communicating meaning than compositionality and has to be recognised as a basic, primary property that creates the meaningful representation. The only way to achieve this seems to be to postulate a level of meaning to which both compositionality and intentionality contribute. This level is the propositional representation and it is the only level we

[6]See e.g. Ludlow (1999); Jaszczolt (2005:Chapter 6).

[7]By the same token, the present forms of futurative progressive as in (4) and tenseless future as in (5) express modality.

[8]The literature on this topic is ample. See e.g. Carston (1988); Recanati (1989); Bach (1994); Jaszczolt (1999a,b); Carston (2001).

need in the theory. I have provided theoretical arguments and supporting evidence for this economy of levels elsewhere (Jaszczolt 1996, 1999a,b, 2002a). There are no satisfactory theoretical arguments, neither is there any empirical evidence, for any other level of meaning. It has to be said, though, that both the standard view of the underspecified semantic representation and my proposal of the merger representation are hypothetical, theoretical constructs, and both aspire to psychological reality. In other words, what we ultimately want is to find out how we represent meaning in the mind. The merger representation is one such proposal of a mental representation of meaning.

Now, it may seem that having questioned the omnipresence of underspecified representations, we have to subscribe to semantic ambiguity. After all, if (8) is not underspecified as to the exact meaning of the definite noun phrase, then it seems that it has to be ambiguous between the referential reading (8a) and the attributive meaning (8b):

(8) The youngest contestant won the piano competition.

   a. Jimmy Brown won the piano competition.

   b. The youngest contestant, whoever he or she was, won the piano competition.

But the merger representation allows for avoiding both underspecification and ambiguity. Since both underspecification and ambiguity are methodologically less adequate in that they would entail less economical processing of utterances than the merger representation to which intentionality contributes, the latter is more psychologically plausible and more explanatorily adequate. Intentionality allows for different strengths. For example, on the (a) reading of (8), intentionality is stronger than on the (b) reading. The mental state is about a particular, known, identified individual. By the same token, the intentions associated with the utterance are stronger on the (a) interpretation. We can distinguish (i) an informative intention, (ii) a higher-order intention to communicate that one has an intention to inform the hearer about something (see Sperber & Wilson 1986:61)[9], and (iii) a referential intention, an intention to talk about (refer to) an individual or object (Bach 1987, 1992; Jaszczolt 1999a,b). In (8), it is the strength of the referential intention that distinguishes (a) and (b) readings.

The strongest intentionality is the default intentionality. In other words, a mental state is about some objects or situations and it is only through some context-dependent 'dispersal' of this intentionality that the intentionality can become weakened.[10] This default intentionality results in default readings of utterances. In (8), the default reading is the (a) reading and it corresponds to the strongest referential intention. In other words again, there is standard, 'normal', 'undispersed' intentionality which guarantees default, standard interpretations. Non-default interpretations, such as (8b), are departures from the standard intentionality and are triggered by information coming from context. This information 'overrides' the default, so to speak, in that it prevents it from arising. Since the strongest intentionality means simply the strongest aboutness, the default readings are the ones which secure the referent of the speaker's utterance, be it an individual or a situation. This is summarised in the Primary Intention principle (PI):

[9]Alternatively, these two types of intentions can be regarded as one illocutionary-communicative intention, guaranteed by a 'communicative presumption' (Bach & Harnish 1979:7): when the speaker says something to the addressee, the speaker does so with some intention.

[10]For a detailed explanation of the dispersal of intentionality see Jaszczolt (1999b:188).

PI: The primary role of intention in communication is to secure the referent (individual object or individual eventuality) of the speaker's utterance.[11]

It is essential at this point to stress the difference between the mechanism of 'overriding' defaults that is used in my account and the mechanism of enrichment used in underspecified semantics. Let us take example (8) again. Definite descriptions are by definition associated with intending a particular, identifiable referent. On my account, there is no need to postulate separate stages of this process of reaching the referential interpretation: the reading is normally referential and it simply takes place by default. On the underspecified semantics account, one has to postulate an underdetermined, 'unfinished', so to speak, representation of the meaning of the utterance, whose development can proceed in different directions: towards a referential reading, an attributive reading, or a referential but referentially mistaken reading. Underspecified semantics rests on the well acknowledged assumption that the syntactic structure and the lexical meaning are processed separately from other types of meaning-giving information such as contextual clues or the strength of intending. This is not so on the default-semantic account. The output of all the sources of meaning information merges to produce a unique representation of the meaning of the utterance. There is no separate logical form, no level of ambiguous or underspecified meaning. There is a merger, an output of all the sources and this output is either the default one or a non-default one.[12]

In the case of the referential/attributive distinction in (8), the strength of the referential intention, its default and non-default value, is responsible for the two different interpretations. In the case of the temporal and truth-functional readings of *and* in (9), it seems to be the difference in the strength of the informative intention that gives the (a) and (b) readings. The stronger informative intention produces a more informative (a) reading which is the default reading:

(9) I wrote a paper and went on holiday.

a. I wrote a paper and then went on holiday.

b. I wrote a paper and went on holiday but not necessarily in this order.

Work on the types of defaults involved in sentential connectives is still in progress (see Jaszczolt forthcoming, 2005 for *cognitive* and *social-cultural* defaults). Be that as it may, it is clear that readings of utterances can be ordered on a scale from most typical to the most context-dependent. The most typical ones are the default ones, generated without the help of the situational context. The theory of generalized implicature (Levinson 2000) provides ample arguments for the existence of such defaults. But identifying defaults is not the end of the task. We have to explain how they arise. The merger representation provides such an explanation in that normally intentionality is not 'dispersed' and hence normally intentions are strong.

Now, which type of intention is responsible for these degrees depends on the type of the expression. In the case of definite descriptions, it was the referential intention. In the case of the sentential connective *and*, we tentatively postulated the communicative intention. In the next section, I consider the readings of sentences with *will* and assess the correlation between intentions and utterance interpretations.

[12] In Default Semantics, compositionality is sought at the level of the merger rather than on the level of word meaning and sentence structure. The theory of merger representations is developed in detail in Jaszczolt (2005). I am grateful to the anonymous reviewer for pointing out to me the need to clarify this point here.

3.3 Modality, futurity, and the degrees of intentions

When temporal expressions allow for multiple readings, one reading is normally more plausible than the others and we need not consult the context to select it. Instead, this reading is a default interpretation. For example, in (10), it is implicated that Mary no longer travels a lot. This can be explained by a Q-implicature based on the scale in (11). According to this scale, since the past tense expression has been used, it is implicated that the property of travelling a lot does not apply to Mary's present life (cf. Levinson 2000:95). The 'past only' reference is only implicated because it can be cancelled by adding, for example, (12):

(10) Mary used to travel a lot.

(11) <PRESENT, PAST>

(12) In fact, she still does.

However, (12) has to be there in order for the default, 'past only' meaning of (10) to be ruled out. The simplest explanation goes as follows. The speaker refers to an event using the past tense whose main communicative function is to communicate a past event or state. It can be tentatively hypothesised that the two readings of (10) correspond to various degrees of informative intention associated with the grammatical form, where the 'past only' interpretation is more informative, i.e. has more informational content. It is at least possible that (10) is a case of a cognitive, that is intentionality-based, default.

Furthermore, the ambiguity between modal and temporal sense of *will* can be resolved by the strength of the intentionality and intentions. In (13), *will* refers to future time, while (14) expresses a statement about the present. In (14), *will* is unquestionably modal.

(13) Mary will have her breakfast at 8 o'clock tomorrow morning.

(14) Mary will be eating her breakfast now.

(cf. Jaszczolt 2002b:264). As is well known e.g. from Enç (1996), futurity and dispositional modality are not disjoint. The future *will* can be regarded as a type of modal *will* in that it involves a prediction that is itself a type of modality. The intentionality-based explanation of this connection proceeds as follows. Intentionality is a property of mental states that makes them have objects as correlates. Derivatively, intentionality is instantiated in the property of linguistic expressions that makes them refer to individuals or states of affairs. This association can be stronger or weaker, it can be captured in an analysis in terms of possible-worlds semantics. In modal expressions, the degree of the speaker's commitment to the described eventuality is involved. This gradation entitles us to conclude that the future *will* is not qualitatively different from modal *will*. In sum, the gradation of intentionality strongly suggests that *will* is modal. However, the association of the degree of intentionality with the default reading of a modal expression will have to change: the 'most modal' reading is the one that corresponds to the weakest intentionality and at the same time is the default. This proposal is taken up in Section 5.2 in the context of Grice's unified account of modality translated into DRT.

4 DRSs as merger representations

In Section 2.2 it was argued that the psychologically plausible theory of meaning would have to postulate one level of meaning representation to which information is contributed by sentence structure, individual concepts, and intentionality of the mental state. DRSs (Kamp & Reyle 1993:61) are ideal candidates for such mergers. They allow for representing multisentential discourses as units, for accounting for anaphoric (including presuppositional) links even in long discourses, and most importantly for contextual update, including both semantically encoded and pragmatically conveyed information on one level of representation. Accounting for changing context is the definitional property of dynamic semantic theories. Just as discourse interpretation is incremental, so DRSs are constructed, so to speak, bit by bit, where earlier chunks of the representation constitute the background for interpreting the following chunks. DRSs consist of formal counterparts of individuals, called discourse referents, and compositional predicate-argument(s) representations called DRS-conditions. They are theoretical constructs aspiring to the status of mental representations.

The various senses of *will* are best represented in dynamic representations such as DRSs in that we will be able to account for the fact that utterances with *will* are not ambiguous in spite of representing either the future or modality. Kamp and Reyle's (1993) account of *will* is couched in terms of the 'earlier-later' relations, where times are regarded as intervals, and the reference point is fixed and is normally the utterance time (*n*). Sentence (3) repeated below, acquires a representation as in Figure 1:

(3) Mary will go to the opera tomorrow night.

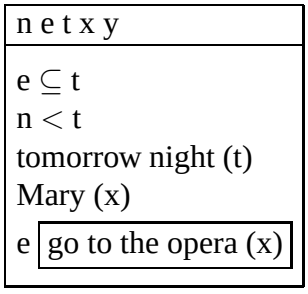

Figure 1: DRS for sentence (3)

In terms of construction rules for temporal reference, for future tense we introduce into the DRS condition set the conditions n<t and (i) e ⊆ t for events, and (ii) s ◯ t for states, where *t* stands for the time of the eventuality, *e* for an event, *s* for a state, < for temporal precedence, ⊆ for temporal inclusion, and ◯ for temporal overlap. The sentence structure is replaced as normal by the predicate-argument(s) structure.

In Kamp and Reyle's version of DRT, this is a way of representing grammatical tenses. The general principle is as follows:

> 'The algorithm must represent the temporal information that is contained in the tense of a sentence and in its temporal adverb (if there is one).' Kamp & Reyle (1993:512).

> '[The feature] TENSE has three possible values, *past*, *present*, and *future*, signifying that the described eventuality lies before, at, or after the utterance time, respectively. The value of TENSE for a given sentence S is determined by the tense of the verb of S. When the main verb is in the simple past, TENSE = *past*; when it is in the simple present, TENSE = *pres*; and when the verb complex contains the auxiliary *will*, TENSE = *fut*.' Kamp & Reyle (1993:512–513).

However, since the DRSs contain information from the context of interpretation of the utterance of the sentence, this is only a guide rather than a rule. Just as we can anchor the feature TENSE to the grammatical tenses, so (and even more so) can we anchor it to the situation of discourse. And the situation may call for the interpretation of *will* as a marker of epistemic or dispositional necessity. Similarly, the context, and even the linguistic context in the form of a temporal adverb as in (5) and (4) repeated below, may dictate the assignment of future time reference where there is no future tense. If the content of (3) were expressed by means of tenseless future or futurative progressive as in (5) and (4) respectively, the representation would then remain the same because (5) and (4) are interpreted as referring to a future time.

(5) Mary goes to the opera tomorrow night.

(4) Mary is going to the opera tomorrow night.

The differences between (3), (4) and (5) concern the strength of the assertion, the strength of evidence or claim. In other words, they pertain to modality. This difference will have to be captured by a separate operator as is proposed in Section 5.2.

To sum up, in addition to the properties of *will* as exemplified in (1)–(3), the default-semantic study has to account for the concept of futurity. As was exemplified in (3)–(5), futurity can be expressed not only by tenses using the auxiliary *will*/*shall*, but also by tenseless future and futurative progressive. It can also be expressed by periphrastic forms such as *to be going to* + *verb*, *to be about to* + *verb*, etc. We have observed that there is a qualitative difference between the present and past on the one hand, and the future on the other, and have gathered a collection of partial arguments in support of the future as modality. We can now strengthen this tentative proposal by testing how a modal future can be accounted for by adding a general modality operator to DRT. This operator will have to account for the differences between (3), (4) and (5) and hence replace the unsatisfactory solution of Figure 1. More importantly, it will have to render the degrees of modality of *will*, as was proposed in Section 3.3 in line with the principles of Default Semantics. I test this solution in Section 5.2.

5 Modal defaults

5.1 The ACC operator

Modality is not a clearly demonstrable category. Deontic and epistemic modalities are distinct concepts. Furthermore, epistemic modality includes both judgements of necessity and possibility and the degrees of commitment based on evidence (see Palmer 1986:224). However, the concept of the degree of commitment permeates all the modal terms. I shall use this intuition in proposing an amendment to DRT in which one single representation of a sentence with *will* captures various degrees of such commitment.

One way of accounting for the various senses of *will* as exemplified in (1)–(3) repeated below would be to admit its ambiguity.

(1) Mary will be in the opera now.

(2) Mary will sometimes go to the opera in her tracksuit.

(3) Mary will go to the opera tomorrow night.

This descriptive solution is offered for example by Hornstein (1990:38):

> '...the various readings of *will* (...) indicate that it is an ambiguous morpheme in English. In one of its guises, it is a future-tense marker. In addition, it is a modal that underlies the imperative. In this latter role, it is roughly translatable as *must*.'

Hornstein rejects the attempts to assimilate the future tense to a modal and provides a range of examples showing their different behaviour. However, this rejection seems to rest on a conceptual mistake. In the unified treatment of *will* we do not identify the future tense with a modal. We merely point out that *will* allows for a unified semantic representation that makes use of the degrees of modality. In other words, it is perfectly natural to say that *will* marks primarily the future temporal reference and at the same time that this temporal reference is a subcategory of modality, notwithstanding the different syntactic patterns and collocations into which the various senses of *will* can enter.

The main question left to answer is the status of this alleged 'ambiguity'. If it is to mean that *will* acquires different readings in different contexts, there is no harm in adopting this term. However, the term 'ambiguity' is so theoretically loaded in semantics and pragmatics that assigning this property to *will* would be at least confusing. Firstly, as Grice (1978) proposed and post-Griceans endorsed, senses are not to be postulated beyond necessity. Where no ambiguity appears as a real, verifiable stage of utterance processing, it should not be postulated. This is captured by the principle of the Modified Occam's Razor. The generally accepted alternative to an ambiguity account is to evoke the generality of sense and the underspecification of the semantic representation. In other words, at some early stage of utterance processing, *will* can go either way: to stand for futurity, or epistemic or dispositional necessity. This is more plausible than a postulate of ambiguity based on different syntactic constructions into which *will* can enter.

Now, as I have argued in Section 3.2 and in various other presentations of Default Semantics (see e.g. Jaszczolt 1999a,b, 2002b, forthcoming), underspecification does not stand up to the fact that some interpretations of such multiple-reading sentences are more salient than others and arise without the help of the context. In other words, since there are default interpretations, underspecification need not always ensue. Instead, there is a default reading and the departures from the default, where these departures correspond to the lower degrees of the relevant intention. These departures are ordered on a scale that is driven by the degrees of intentions and intentionality (see Section 3.1). The conclusion we arrive at is that 'unreal' ambiguities, that is ambiguities that do not arise in utterance processing, need not be postulated, but neither do underspecified representations. It is important not to equate this thesis with the claim that there is no semantic ambiguity and no underspecification. Both may be the case in utterance processing but neither needs to be evoked for the semantics of, say, definite descriptions, propositional attitude reports, various senses of *will*, and, we can say tentatively (see Jaszczolt forthcoming, 2005), various senses of sentential connectives such as *and*.

The next task is to demonstrate in detail how this thesis of default semantics applies to *will*. Sentence (3) obviously has future time reference. One may argue that this is so because of the temporal adverb 'tomorrow' and hence there is no context-free default involved. However, (3a) evokes the same sense of futurity[13]:

(3) a. Mary will go to the opera.

In DR-theoretic terms, we simply have an event *e* of Mary's going to the opera at a time interval *t* which follows the utterance time *n* (see Figure 1). Now, according to the theory, (2) would have to have present time reference with the habitual aspectual marker. On the other hand, (5) would have to have future time reference. What differs between (3), (4) and (5) is the degree of certainty, speaker's commitment, speaker's evidence that the event of Mary's going to the opera will take place. What the tokens of *will* in (1)–(3) have in common is constituting a scale of degree of modality. It seems that a common framework for all these cases is needed and the best place to start would be to identify the category which can allow for such degrees of commitment. Having provided reasons against any sort of ambiguity, we have to settle on a modal operator. We shall use for this purpose Grice's argument for deriving modals from the common source of *acceptability*.

Grice (2001:90) proposed that modals are 'univocal across the practical/alethic divide'. He called this theory an Equivocality Thesis. In the formal argument he introduced a rationality operator 'Acc' meaning 'it is (rationally) acceptable that'. This operator accounts both for the modality of (15) and that of (16):

(15) John should be in London by now.

(16) John should take more care of his business affairs.

He introduces modal operators for modalities in (15) and (16), alethic ($\vdash$) and practical (!) respectively, and demonstrates that practical and epistemic (alethic) 'must' and 'ought/should' fall under the general concept of acceptability. We obtain the following senses:

Acc $\vdash$ p 'it is acceptable that it is the case that p'
Acc ! p 'it is acceptable that let it be that p'

In other words, there are reasons for belief (alethic, epistemic, dynamic) and reasons for action (practical, deontic) and they are traceable to the same concept.

5.2 The analysis

In the light of Grice's arguments for the uniform operator of ACC, it is at least plausible to suggest that *will*, being a species of modality for the reasons to do with avoiding unnecessary ambiguity or underspecification defended in Default Semantics (see Sections 3.1–3.3), can be subsumed under the same category of acceptability. Namely, there is epistemic *will*, derived from the concept 'it is acceptable that', followed by the specification of time. If this move proves successful, it will account for the modal status of *will* and allow for its differing time reference.

[13]The default sense of futurity for descriptions of states is weaker than that of events but does not contradict the current argument.

Acceptability, meaning 'it is reasonable to think that', 'it is rationally plausible that', allows for degrees. An event can be more, or less, acceptable due to being more, or less, certain, allowing for more, or less, commitment on the part of the speaker. For example, dispositional necessity in (2) comes with stronger acceptability than epistemic necessity in (1), which in turn comes with stronger acceptability than the regular future *will* in (3). In (3), the reading is 'it is to be expected that she will go', 'she will probably go'.

Grice also attempts to derive practical modality from alethic in that if something 'must [deontically] be the case', it is so because it 'must [epistemically] be the case (see Grice 2001:90–91). This philosophical discussion will not be further pursued here. Suffice it to say, that this is a strong and intuitively plausible argument for the underlying identity of various types of modality as 'it is reasonable to think that'.

Now, just as the modal and temporal *will* can be subsumed under Acc, so can the futurative progressive and tenseless future in (4) and (5) respectively. In terms of DRT, they will both have to result in DRSs as in Figure 1. DRSs have to capture the mental representation of the discourse and hence it seems that although there is no future tense expression involved in (4) or (5), the DRS should reflect the true semantic temporality of the event.

On our current account, however, Figure 1 will not do. Just as we encountered different strengths of Acc in (1)–(3), so do we encounter them in (5), (4) and (3). Following Dowty (1979), we take it that tenseless future corresponds to the strongest assertion, futurative progressive comes next, and regular future comes out as the weakest, neutral. In Default Semantics, this strength of assertion can be accounted for by means of the degree of the informative intention, paralleled on the level of mental states by the degree of intentionality. The DRSs for (1)–(3) and (4)–(5) will now have to obey these findings concerning their interrelations and gradation of the strength of intentionality and intentions. For convenience, I repeat this set of examples below. In representing the set A, we are implementing the earlier findings concerning the properties of *will*. In the set B, we are implementing the earlier findings concerning expressions of temporality. The sentences in each set are presented in the order of decreasing intentionality.[14]

Set A

(2) Mary will sometimes go to the opera in her tracksuit. (dispositional necessity)

(1) Mary will be in the opera now. (epistemic necessity)

(3) Mary will go to the opera tomorrow night. (regular future)

Set B

(5) Mary goes to the opera tomorrow night. (tenseless future)

(4) Mary is going to the opera tomorrow night. (futurative progressive)

(3) Mary will go to the opera tomorrow night. (regular future)

[14]It can be argued that tenseless future expresses a lower degree of commitment than regular future in that it can be hedged as in (5a):

(5) a. Mary goes to the opera tomorrow night, it seems.

However, hedging is caused here by the fact that the statement communicates a high degree of commitment that results, for example, from checking the daily schedule in Mary's own diary. In other words, 'it seems' signals the illocutionary force rather than hedging the propositional content.

The first principle to follow in representing them is Grice's Modified Occam's Razor, i.e. avoiding unnecessary ambiguity. So, if five distinct representations can be avoided because there is a more 'unified' and otherwise equally adequate analysis, the latter should be preferred. Just as the senses of *will* in Set A are related, so are the expressions of futurity in Set B. However, neither should we relegate Set B to one representation, say, as in Figure 1. The difference of the degree of intentionality and intentions is meaningful and has to be captured in a DRS. When we make use of the operator of acceptability, we can capture all these dependencies. For the purpose of the DR-theoretic analysis, I introduce the operator 'ACC' that is a modified Grice's 'Acc' as incorporated into DR-theoretic representations and to our theory of temporality as modality. The main difference is that I propose to introduce ACC as an operator on *events* rather than propositions.[15] Bringing sets A and B together conforms to our earlier conclusion that (i) *will* is modal, and, as an issue overlapping with it, (ii) the semantic category of futurity is modality. I will now attempt to account for these examples by using this overarching modal category of acceptability in the form of the ACC operator on events.

In (3), it is not only the future time reference that we have to represent but also the degree of acceptability. We could now try to represent (3) as in *Figure 2, where 'ACC e' stands for 'eventuality *e* is acceptable to the speaker':

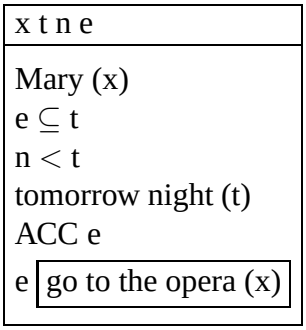

*Figure 2: DRS with ACC e for sentence (3)

Note that, unlike on Kamp and Reyle's account, the condition n<t does not come from 'will'. It comes from the lexical meaning of the adverbial 'tomorrow night'. 'Will', on the other hand, is accounted for by ACC.

It also has to be noted that DRS-construction rules operate on relevant parts of syntactic configurations. Therefore, it is essential that the syntactic theory we adopt reflects, or at least is compatible with, our account of futurity as modality on one hand, and our account of *will* on the other.

What we need in order to improve on *Figure 2 is distinguishing degrees of commitment to the proposition expressing *e*, or degrees of probability. In other words, we need degrees of modality. The simplest thing to do would be to index ACC for these three sentences. But this will not yet capture the concept of *acceptability to a degree*. We can use here a device well known from hidden-indexical theory where the *type of mode of presentation* accounts for the differences between different readings of, say, propositional attitude reports (see Schiffer 1977, 1992, 1996; Ludlow 1995, 1996; Jaszczolt 1998a,b, 1999b, 2000a,b). On Schiffer's (1992) account, sentence (17) has the logical form as in (18):

[15]For the semantics see Jaszczolt (2005).

(17) Ralph believes that Fido is a dog.

(18) $\exists m(\Phi^* m$ & Bel(Ralph, <Fido, doghood>, $m))$

where Φ^* is 'an implicitly referred to and contextually determined type of mode of presentation' (Schiffer 1992:503). In Jaszczolt (1998a,b, 1999b) I proposed instead the degrees to which *m* has to be specified. In other words, *m* can be coarsely-grained or finely-grained and we have to allow the varying degrees of detail through varying Φ^*. Sometimes it is relevant to the meaning of the utterance under what guise we think of the referent (say, Fido as a gold medallist of a dog show but not as your neighbour's noisy poodle), at other times it is irrelevant, yet on other occasions all that may matter is the referential mistake made by the speaker. The latter case is the middle degree of granularity of $\Phi^* m$ and corresponds to my *de dicto*$_1$ reading. All in all, we have:

(i) *de re* reading – no relevant *m*;

(ii) *de dicto*$_1$ – coarsely-grained $\Phi^* m$, distinguishing between referential mistakes and correct ascriptions;

(iii) *de dicto proper* – finely-grained $\Phi^* m$.

$\Phi^* m$ adopts values from 0 (*de re* reading), to 1 (*de dicto proper* in my terminology), through the intermediate reading that involves a referential mistake (*de dicto*$_1$). It seems that we can use the same principle of the scale of detail of *m* ($\Phi^* m$) for futurity. Set B will now be represented by a DRS in *Figure 3:

x t n e m
Mary (x) e $\subseteq$ t n $<$ t tomorrow night (t) mode of presentation (m) ACC$_{\Phi^* m}$ e e [go to the opera (x)]

*Figure 3: DRS with ACC$_{\Phi^* m}$ for sentences (3)–(5)

Using some elements of neo-Davidsonian analysis of events (Parsons 1990), adapted to match our earlier theoretical orientation, the simplified logical form for the sentences in Set B will now be as in *(19):

*(19) $\exists$m $\exists$e($\Phi^* m$ & ACC$_m$ (Going-to-the-opera (e) & Subject (Mary, e) & Tomorrow-night (e)))

This representation will not suffice, though. Schiffer's $\Phi^* m$ suffers from overdetermination, it provides more information than is necessary for getting the truth conditions right. Hence, I have introduced the degree of *m* instead, as exemplified in the belief report sentences and in (i)–(iii)

above where Φ^*m adopts values from 0 to 1. The logical form for Set B will now incorporate information that *m* matters to a certain degree of granularity. Instead of Φ^*m, I now introduce Δ that stands for that ingredient of ACC that makes it into a particular type of modality. The value of Δ, as for example here $\Delta = \vdash$, has to be specified in the formal semantics.[16] Δ^n stands for the degree *n* of granularity of Δ and is substituted it for Φ^*m as in ?(20):

?(20) $\exists\Delta$ $\exists$e $\exists$n (Δ^n & ACC_{Δ^n} (Going-to-the-opera (e) & Subject (Mary, e) & Tomorrow-night (e)))

?(20) is not the only way of representing the type of ACC. If we were to depart from the Montagovian tradition and adopt the stance that temporality is to be expressed as a referent or an adverb, the logical form would change accordingly. However, I adopt the operator analysis as it best captures the degrees of intentionality and intentions that differentiate between the uses of *will* in (1)–(3) and the uses of different expressions of futurity in (3)–(5).

All in all, the DRSs for (3), (4) and (5) look as in Figure 4, with the Δ^n varying from, let us say, Δ^{tf} for the tenseless future form in (5), through Δ^{fp} for the futurative progressive in (4), to Δ^{rf} for the regular future in (3).

x t n e
Mary (x) e $\subseteq$ t n $<$ t tomorrow night (t) ACC_{Δ^n} e e [go to the opera (x)]

Figure 4: DRS with ACC_{Δ^n} for sentences (3)–(5)

These three indices correspond to three degrees of modality, derived from the three degrees of informative intention [17] and at the same time three degrees of intentionality of the corresponding mental state, as summarized in the DI principle in Section 3.1. In Δ^{tf}, reference is made to the future event without expressing any degree of detachment from the proposition expressed. Hence, this is the case of the strongest intentionality. In Δ^{fp}, the degree of commitment of the speaker to the proposition expressed is lower and hence a higher degree of modality is involved: modality is in an inversely proportional relation to the degree of commitment or assertability, possibility, evidence, etc. It is also in an inversely proportional relation to the degree of intentionality of the corresponding mental state as well as to the degree of the communicative intention with which the proposition was uttered. In Δ^{rf}, we have the highest degree of modality and the lowest degree of commitment.

[16] See Jaszczolt (2005:Chapter 6).

[17] I have ascribed the degrees of strength to the informative intention but it is perhaps more plausible to ascribe them to the referential intention with the proviso that whole eventualities are *referred to*. However, this move would require some additional theoretical assumptions and would blur the distinction between referring to individuals and referring to whole propositions that is so useful for explaining *de re* and *de dicto* readings of propositional attitude reports (see Jaszczolt 1996, 1999b). Nothing important depends on choosing this option.

It has to be remembered, however, that these degrees only matter when we juxtapose the grammatical forms used in a language to express a future eventuality. I am not suggesting that the form with tenseless future (example 5) is the default way of expressing the future just because it corresponds to the strongest intentionality. It would be the default if future were merely time rather than modality. However, we have argued that it is modal. Hence, the default is the 'most modal' of the three forms, i.e. the standard, regular future in (3).

Now, examples (3), (4) and (5) do not exhaust the possibilities of referring to future eventualities, neither has it been empirically confirmed that (3) differs from (4) to the same degree, so to speak, as (4) from (5) as far as the degree of modality and the degree of intentionality are concerned. Hence, the superscripts *rf, fp* and *tf* cannot be replaced by numerical values for intentionality of, say, 0, 0.5, and 1 respectively. A thorough data-based study of the usage of various ways of expressing the future may reveal some quantitative dependencies but this is a separate large project that will have to wait until the theoretical preliminaries prove adequate.[18]

In the above proposal, I have departed from the DR-theoretic practice, on Kamp and Reyle's (1993) version, of representing *tenses*. Instead, I focussed on the dependencies between tenseless future, futurative progressive and regular future tense in relegating the differences to Δ^nm. This move was dictated by our earlier conclusion that temporality, at least with respect to the future, if not generally, is more adequately described as modality, degree of commitment, or ACC. In order to account for futurity, I have combined (i) an investigation of the auxiliary *will* with (ii) the investigation of *futurity* as a semantic category. The latter, (ii), resulted in the representations in Figure 4, with *n* of Δ^n varying between *tf, fp* and *rf*. These values represent some, as yet unspecified, points on the scale of *n* ranging from 1 to 0 as in Figure 5:

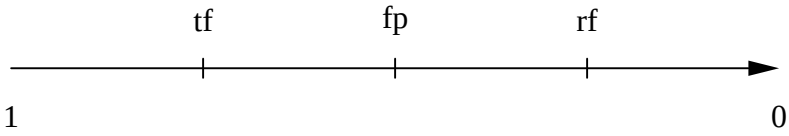

Figure 5: Expressions of futurity and the strength of intending

To repeat, the placement of the values on the scale is arbitrary as it has not been determined. While we know the relative positions of *tf, fp* and *rf* from the properties of use of these forms, their absolute placement on the scale will require a detailed empirical study.

Problem (i) concerns examples (1)–(3). (3) is well accounted for by ACC and Δ^n as in Figure 4. As far as (1) and (2) are concerned, we can now account for them by a comparison of the relative strength of ACC in (1) and (2) with that of the regular future in example (3). Firstly, it has to be noted that we have adopted the position that temporal markers have their unmarked, default interpretations. This standpoint is founded on the principles PoL, DI and PI of Default Semantics (see Sections 3.1–3.3 above). Just as 'goes' by default expresses simple present and 'is going' continuous present, so 'will go' by default expresses simple future. Kamp and Reyle's analysis works well for these default meanings. Where it becomes problematic is the departures from these defaults such as tenseless future of (5), futurative progressive in (4), and also *will* of epistemic and dispositional necessity as in (1) and (2) respectively. As was presented above, the default sense of *will* can be intuitively correctly accounted for by ACC and Δ^{rf}. Now, just as the epistemic necessity *will* and dispositional necessity *will* are not the default uses of *will*, so

[18]Nuyts' (2001) 'scale of likelihood of a state of affairs' could prove of use here, with the proviso that futurity *is* modality. See also Jaszczolt (2003b).

tenseless future is not the default use of the form 'goes' nor futurative progressive a default use of 'is going'. Each of these expressions can be used with its default sense or with a sense that departs from this default. This departure corresponds to different strengths of ACC, explained by different degrees of intentionality and relevant intentions as in the DI principle. In the present investigation of futurity and markers of the future, pursuing the topic of scales for modalities would not be relevant. Suffice it to say that the respective degrees of strength would have to be constructed by analogy to the degrees of *will* discussed below.

In short, scales of intentionality are useful in two ways. Firstly, we can represent the observation that future time reference is scalar, as in Figure 5, adding other forms such as epistemic *may*, epistemic *can*, *might*, *could* with future-time reference towards the 0 end of the scale. But secondly, and more importantly, we can present the interrelations between different uses of a particular linguistic form such as 'will', 'goes' or 'is going'. Just as future time reference has its default expression in (3) rather than (4) or (5), so every such expression belongs to its own scale of defaults and departures from defaults. In this way, the sense of *will* in (3) is the default among (1)–(3).

Regular future *will* acquires the DRS with the ACC operator and the degree of granularity of Δ set at *rf* (Δ^{rf}). *Will* of epistemic necessity in (1) can now be presented as overriding $\text{ACC}_{\Delta^{rf}}$ by the condition 'now (t)'. Even if the temporal adverb 'now' were not overtly present in the sentence, it would have to be recovered from the context by the addressee. Dynamic representations such as DRSs have means of accounting for this type of conversational inference. If 'now (t)' were not communicated, *will* would remain of the default, $\text{ACC}_{\Delta^{rf}}$ type.

In order to distinguish epistemic *will* from epistemic *must* etc, we specify in the construction rules the route to ACC. We can represent it as $\text{ACC}_{\Delta^{rf}} \rightarrow_c \text{ACC}$. The symbol '$\rightarrow_c$' stands for 'contextually results in'. The partial DRS for sentence (1), repeated below, is now as in Figure 6[19]:

(1) Mary will be in the opera now.

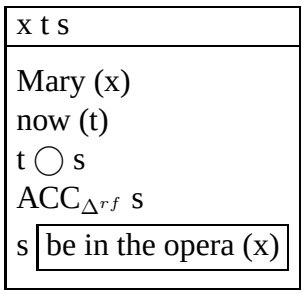

Figure 6: Partial DRS for sentence (1)

Naturally, epistemic *will* enters into scales of strength with other expressions of epistemic modality, just as the future *will* entered into the strength-of-modality scale with tenseless future and futurative progressive *will*. But, as was argued above, this is an issue separate from the current investigation of the future. The route to ACC represented by $\text{ACC}_{\Delta^{rf}} \rightarrow_c \text{ACC}$ in a construction rule for Figure 6 uniquely identifies the form used in (1), i.e. epistemic necessity *will*.

[19]The DRS is partial because we ignore the detailed representation of the state *s*/event *e*.

Finally, the dispositional necessity *will* of (2) acquires an analogous representation. Sentence (2) is slightly more straightforward to represent than (1) in that the adverbs 'sometimes', 'normally', etc. are almost always present either in the sentence under analysis or in the preceding sentences of the discourse, and hence can be easily included in the DRS. The route for ACC is as before: $\text{ACC}_{\Delta^{rf}} \rightarrow_c$ ACC and the difference between epistemic and dispositional necessity is guaranteed by the information contained in the adverb – either overtly expressed or recovered from the context. The partial DRS for (2) repeated below is as in Figure 7[20]:

(2) Mary will sometimes go to the opera in her tracksuit.

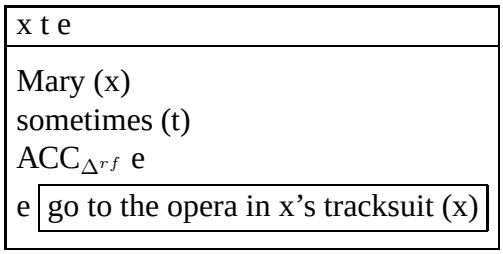

Figure 7: Partial DRS for sentence (2)

The difference between *will* and, say, *would* is maintained by retaining the route $\text{ACC}_{\Delta^{rf}} \rightarrow_c$ ACC in the construction rules. The analysis of *would* and the analysis of conditionals related to it are separate, albeit very relevant, projects for future research.

Similarly, a formal semantic analysis of the temporality adverbials will not be provided here. The main purpose was to give some theoretical support to the idea that temporality is an aspect of commitment to the communicated eventuality, and hence a constituent of modality. This has been attempted through an analysis of the relevant expressions with respect to the degrees of relevant intentions of the utterance and the degrees of intentionality of the corresponding mental act. The development of this idea and the possible empirical precisification of the values on the relevant scales will be the next step.

Now, it has been attempted in the literature to explain the uses of will in (1)–(3) as 'colouring' of the future reference by some modal overtones such as volition (e.g. Wekker 1976:67). There are various disadvantages of this move. Firstly, one has to assume that futurity counts as a basic function and modality as an overtone. Secondly, one has to classify such modal overtones and specify descriptively when they are likely to occur. Next, one has to postulate an ambiguity between e.g. volitional and non-volitional future *will* as in (21):

(21) Ludwig won't eat his food.

Finally, one has no means of accounting for the epistemic *will* as in (1), or for the dispositional will in (2), where under the latter we can include Wekker's (1976:2) 'characteristic' (habitual) and 'inference' readings as in (22) and (23) respectively:

(22) Mary will often listen to loud music just to annoy me.

(23) Water will conduct electricity.

[20] I am indebted to the anonymous reviewer for comments on the earlier versions of these DRSs.

On our current account, these problems do not arise as futurity is incorporated in the overarching category of modality, accounted for by various values and various conditions associated with the uniform operator ACC. Instead of colouring of the future, 'degrees of modality' can be taken as the working hypothesis for the explanation of the diversified uses.

5.3 The symmetry of the past and the future?

A brief disclaimer is required at this point. Future as a modality can be argued for in two ways. We can argue for the modality of time, or for the asymmetrical status of the future and the past. The objective of this paper was to establish the semantic and epistemological status of futurity. Any light this proposal might shed on the status of the past is a topic for a separate paper.[21]

What we have not considered in great detail is the argument from the existence of binary grammatical distinctions of past – non-past as in English, or 'future – non-future' as in one of the languages spoken in New Guinea (Hua). By this criterion, there is future tense. However, this may simply be a modal distinction in which present and past go together as non-modal and future as modal.

6 Concluding remarks

I have attempted to address two interrelated questions, namely (i) whether the English *will* is a marker of modality or tense, and (ii) whether futurity is temporality. I answered question (i) in the Default Semantics framework by suggesting the default temporal status of *will*, and the degrees of departure from the default explained by the degrees of intentionality associated with the mental state, and, by the same token, by the degrees of intentions associated with utterances with which these states are expressed. The highest degree of modality, and hence the weakest intentionality, corresponds to *will* as the marker of future time reference. This suggests that future time reference can be modal in itself. And if it is modal, then the gradation of intentionality is simple because there is no category-boundary crossing from modal to temporal sense. So, the answer to question (ii) is needed to complete the answer to (i). Question (ii) was approached through comparing three ways of expressing futurity.

The final conclusion was that there is a general notion of modality that subsumes all the senses of *will* on the one hand, and various expressions of futurity on the other. This has been found in a modification of Grice's notion of acceptability, an operator on propositions, that I translated into the DR-theoretic operator on events, following the intuitively plausible hypothesis that modality can be subsumed under 'it is reasonable to think that'. By introducing ACC to DRT, we can replace the listing of DRSs associated with different expressions of futurity by one DRS that shows different values for ACC as in (3)–(5). These values are placed on the scale of intentionality. At the same time, we can establish interrelations between different uses of *will* by accounting for the degrees of intentionality (including default intentionality) as in (1)–(3). A formal interpretation of merger representations of Default Semantics as used for the above purpose has been briefly attempted elsewhere[22] but the details are still a matter for future research.

[21] See also Jaszczolt (2005:Chapter 6)

[22] Jaszczolt (2005:Chapter 6)

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TEMPORAL REFERENCE INSIDE AND OUTSIDE PROPOSITIONAL ATTITUDES

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1 Summary

In this paper I discuss one application of a theory whose general features have been presented elsewhere.[1] The core of this theory is a formalism, with well-defined syntax and (model-theoretic) semantics, for the representation of propositional attitudes, complex mental states consisting of several connected attitudes, attitudinal change (i.e. the change from one attitudinal state to another), and attitudes shared by several agents. A second, though closely related purpose of the formalism is that it can serve as part of a semantics of attitude attributing sentences of natural language. In designing the formalism special attention was given to the internal connections between the contents of different attitudes. In the context of attitude attribution these connections manifest themselves as problems for the semantics of discourses consisting of several attitude attribution sentences, which either attribute different attitudes to the same agent at the same time, or different attitudes to the same agent at different times, or attitudes to different agents at the same or different times.

The one example to which the present paper is devoted is a "mini-discourse" consisting of two sentences which ascribe attitudinal changes to the same agent at two distinct times. The example illustrates two recurrent features of multi-sentence attitude attributing discourses. On the one hand it exemplifies the by now familiar fact that in a sequence of two or more attitude attributions the later attributions tend to rely for their interpretation on the attributions which precede them. This is a phenomenon that also arises when the attributions concern one and the same time (as well as one and the same agent) and it is for such cases that it has been identified and discussed in the literature.[2] But in addition the example illustrates a number of issues that have to do with temporal reference and time. Some of these arise at the level of the single sentence. This is true in particular of the question how the tenses of the complement clauses of attitude attributing matrix verbs are semantically related to the tenses of the matrix verbs themselves. But there are also time-related questions that concern the way in which the two attitude attributing sentences are connected, as parts of a single cohesive piece of discourse. On the one hand these have to do with the circumstance that the sentences of our example attribute attitudinal *changes* and on the other with the fact that these changes are said to have occurred at

[1] See Kamp (1990, 2003); van Genabith et al. (in press).

[2] See Stalnaker (1988).

different times. These temporal issues add a new dimension to the general problem how earlier attributions can provide interpretation contexts for later ones.

The theory which I will apply to the example of the paper is an extension of Discourse Representation Theory as it is presented in for instance Kamp & Reyle (1993). More accurately it is a combination of two extensions. One of these concerns the representation of attitudinal states and the semantics of that part of language which is used to describe such states; the other is presupposition. This second extension too has been presented elsewhere.[3] Abridged presentations of both extensions can be found in van Genabith et al. (in press).

I will assume some basic knowledge of DRT, roughly corresponding to Chapters 1, 2 and 5 of Kamp & Reyle (1993). But in Sections 3.1 and 3.2 below I give brief introductions to the two mentioned extensions, which should give the reader enough to understand the treatment that follows in Section 4 of the example that this paper is about. The remaining sections of the paper are all quite short. Section 2 presents the example and lists the problems connected with it on which we will focus. Section 5 sums up and restates the principal morals.

2 The Example and the Issues it raises

The example which that is the topic and focus of this paper is given in (1):[4]

(1) a. On Sunday Bill heard that Mary was in Paris.

b. On Tuesday he learned that on the previous day she had left.

The issues raised by this example that will preoccupy us in what follows all have to do with time. Temporal matters are relevant to the interpretation of (1) for three distinct reasons.

(i) Both attributions are attributions of attitudinal change – i.e. of a change from one attitudinal state to another – expressed by the verbs *hear* and *learn*. As opposed to verbs like *believe*, *want*, *intend*, *regret* and others which are used to attribute a single attitude to their subject at or over a single period of time, such attitudinal change verbs have not received much attention either in the philosophical or the linguistic literature on attitude attribution.

(ii) Like any other attitude attributing sentences with a matrix verb and a *that*-complement, the sentences in (1) raise the problem how the time of the event or state of the complement clause of a matrix verb relates to the time of the matrix event or state. It is a problem which strictly speaking arises for any combination of tenses in main clause and complement clause. But when both clauses are in the present tense, as has typically been the case for the examples discussed in the philosophical literature, the problem can be side-stepped by treating all predications as holding at the utterance time. In the linguistic literature, on the other hand, this problem has been discussed extensively. It is an issue to which I will have nothing new to add in this paper, and I will implicitly rely on the proposals that are documented in the cited publications.[5]

[3] Kamp (2001a,b).

[4] A closely similar example is also discussed in van Genabith et al. (in press), though not as extensively as here.

[5] See for instance Ogihara (1994, 1996); Abusch (1997); Kratzer (1998); von Stechow (2002).

(iii) Each of the sentences of (1) attributes to Bill an attitudinal change: after the change Bill believes something which he didn't believe before it. As usual in cohesive discourse, the interpretation of the second sentence requires the interpretation of the first as context. Moreover, the interpretation of the second sentence must rely on the interpretation of the first in a way which is specific to sentences of this particular kind: The interpretation of the complement clause of the second sentence, which describes the content of the newly acquired belief, relies on the interpretation of the complement clause of the first sentence, which describes the content of the belief acquired on the occasion spoken of in that sentence. But in the case of (1) there is a further complication. The contextual background that is needed to interpret the second complement clause must provide information about the beliefs which the subject Bill holds at the time – some time on Tuesday – when the belief described in the second complement clause is acquired. But the first sentence doesn't tell us anything about Bill's attitudinal state at that time; it only says something about his attitudinal state on the preceding Sunday. Thus, in order to obtain the kind of background information that can support the interpretation of the second complement clause it is necessary to extrapolate from what the first sentence tells us about Bill's beliefs on Sunday to what his beliefs may be expected to have been at the relevant time on Tuesday. Like other bridging inferences the ones we will be considering have a good deal of plausibility. But their plausibility rests on discourse-independent knowledge, and so they introduce into the analysis of examples like (1) an element which is not found in cases where all attitudes attributed to a given subject by a succession of attributing sentences are attributed at one single time.

Sentence combinations like (1) are interesting not simply because they illustrate these different temporal aspects of the semantics of attitude attributing discourse, but also because of the ways those aspects interact, which each other as well as with non-temporal interpretation aspects. Such interactions between different interpretation principles are among the most difficult challenges for semantic theory. One of my aims in the discussion of (1) in Section 4 will be to make this interactional dimension of the example clearly visible.

3 Preliminaries

This section outlines the two extensions of "standard DRT" that were mentioned in the Summary. The extension required for the representation of attitudinal states will be outlined in 3.1, that needed for the treatment of presupposition in 3.2. The presentations will proceed by example and remain largely informal and illustrative. For formal definitions and further technical details the reader should consult the documents that are cited in the Summary.

3.1 DRT-based Representation of Attitudinal States

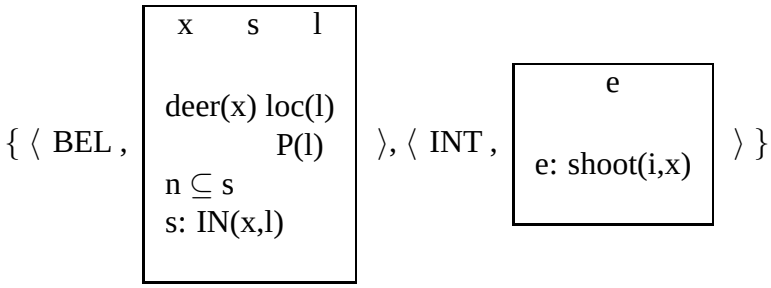
Consider the following scenario. Our subject Bill goes deer hunting in the company of his father-in-law. After reaching the forest where they hope to find what they are looking for they separate, taking different forks of the path which they have been following. At some point Bill sees (or at least he thinks he sees) a deer hidden in the undergrowth and barely visible. The effect of this visual experience is the belief that there is a deer in the location on which his eyes are focused; and this belief gives rise – not surprisingly given the purpose of the expedition – to the intention

to shoot the deer he sees (or thinks he sees). Belief and intention are propositional attitudes, each with its own "propositional content". But these contents are *referentially connected* in that they are targeted on the same individual – the deer that Bill takes himself to be seeing.

The connection between these two contents is reminiscent of the referential connections between the contents of successive sentences of discourse or text, where the later sentences may be anaphorically linked to the earlier ones. When two "propositional" contents are linked in this manner, it is in general not possible to understand them as each determining a self-contained proposition. In the original versions of DRT this difficulty was finessed by focusing on the propositions expressed by the conjunctions of sentences with referentially linked contents. But in the present context this 'solution' is not open to us: since the two attitudes are of different "mode" – one is a belief and the other intention; thus they play distinct roles within the mental state of which they are components, and each plays the role it plays partly because of its own individual content – their contents must be separately identified. Kamp (2003) and van Genabith et al. (in press) present a formal semantics for such representations in which linked content representations receive separate but nonetheless referentially connected semantic values. Here I will only show how the formalism is applied to the case of hunter Bill.

Combinations of propositional attitudes are represented as sets of representations of the individual attitudes, where the representation of each individual attitude consists of a 'mode indicator' – which determines whether the represented attitude is a belief or an intention etc. – and a DRS representing its content. Referential links between the attitudes that make up such a combination are represented by discourse referents that are shared between different content representations. For example, the combination of the described belief and intention of Bill can be represented as in (2)

(2)



Legenda: The content of the belief representation is that currently there is a deer x at a certain location l, which is further specified as satisfying certain characteristics P, about which more below. That the state of x being in location l is a current state is indicated by the condition "n ⊆ s", which says that the state s includes the time indicated by the indexical discourse referent n – as a constituent of the representation of the content of the given belief, n refers to the time at which this belief is being entertained. Note that it follows from this that if an agent entertains an attitude of such a form over some extended period of time, then the truth-conditional import of its content will change as time goes on. Suppose for instance that t1 and t2 are two distinct times within this period during which Bill entertains the belief represented in (2). Then at t1 his belief has the content that the deer x is at the location l at t1, whereas at t2 its content is that x is in l at t2. This phenomenon, of changing truth conditions determined by a constant representational form, will be important in the analysis of our example (1).

The content of the intention of (2) is that Bill, represented by the 'self-representing' discourse referent *i*, shoots x. The referential link between intention and belief is captured by their sharing

the discourse referent x. In this case the semantics of Kamp (2003) and van Genabith et al. (in press) treats the content of the belief as determining an independent proposition and the content of the intention as presupposing the belief content. The intuitive idea behind this is that it is only in combination with the belief that the intention has any real meaning.[6]

With regard to the visual experience which produces in Bill the two attitudes represented in (2) we can distinguish three possibilities: (i) there is a particular object he sees – which thus is the actual cause of his visual perception – and that object is a deer; (ii) there is an object which Bill is seeing, but that object is not a deer; (perhaps it is Bill's father-in-law, whose path has reconverged with Bill's and who is using the bushes for cover in pursuit of his own quarry); (iii) there isn't any object at all that is the perceptual cause of Bill's visual experience; the experience is an optical illusion, not a proper object perception in which the perceived object is at one end of the causal-perceptual chain and the resulting representation in the mind of the perceiver at the other end. Note that Bill's experience is in principle compatible with each of these three possibilities. But for someone who describes the case from his own, external point of view it may nevertheless be possible – and also important – to distinguish between them. (Which of the three possibilities is true can be quite important for what happens when Bill turns his intention into action).

Our representation formalism is designed to capture these distinctions. They are represented by means of *internal* and *external anchors*. In case there is an object which produces in Bill the experience of seeing it (through the kind of causal interaction that is typical of veridical visual perception), then the resulting discourse referent x is said to be *externally anchored to* this object; and in this case the content of any attitude which contains x as part of its content representation will be *de re with respect to* x – it will be a *singular* proposition, which attributes the conditions of the content representation in which x occurs to the object to which x is externally anchored. For example, if there is an external anchor for the discourse referent x in the intention representation in (2), then this representation determines the (doubly) singular proposition that there is an event of Bill shooting the object he is seeing. In the third case, where the experience involves an optical illusion, there is no external anchor.

Bill's impression that he is connected by a relation of causal perception to an object which he thinks he is seeing is, we noted, compatible with each of the three mentioned possibilities. It is a further assumption of the present theory that whenever this impression is present, – i.e. irrespective of which of these three possibilities applies – it confers on the discourse referent which results from the perceptual experience a special psychological status, that of being an entity representation which is the causal product of a perception of the very object that it serves to represent. In the present theory this special status is represented in the form of internal anchors: discourse referents with this status are accompanied by internal anchors, those without this status do not. For instance, if as we have been assuming Bill attributes this special status to the discourse referent x which is the result of his visual experience, then his representation will involve an internal anchor for x (irrespective, to repeat, which of the possibilities (i)–(iii) happens to apply). In the cases (i) and (ii), where there is an external as well as an internal anchor, the propositional content of the belief will be de re with respect to the object to which x is externally anchored.

[6]In general, when two content representations K1 and K2 share a discourse referent α which occurs in the universe of K1 while occurring in K2 only in argument positions of conditions, then the content of K2 is treated as presupposing the content of K1.

From a semantic point of view internal anchors act as presuppositions that their discourse referents are anchored externally. When all internally anchored discourse referents of a propositional representation have corresponding external anchors, the representation will determine the singular proposition described above. On the other hand, representations containing discourse referents with an internal but no external anchor are cases of presupposition failure and do not determine any real proposition at all. This would be the case in particular for both the belief and the intention representation in (2) in the case of possibility (iii) (that of Bill's visual experience being an optical illusion).

As we have told the story of Bill's visual experience it is reasonable to assume that the resulting attitude complex involves internal anchors for both x and l. On this assumption, the representation of this complex in our revised formalism is the one given in (3)

(3)

$$\{\ \langle\ [\text{ANCH,l}]\ ,\ \boxed{\begin{array}{c}\text{l}\\ \hline \text{loc(l)}\\ \text{P(l)}\end{array}}\ \rangle,$$

$$\langle\ [\text{ANCH,x}]\ ,\ \boxed{\begin{array}{cc}\text{x} & \text{s}\\ \hline \text{n} \subseteq \text{s} & \\ \text{s: IN(x,l)} & \end{array}}\ \rangle,$$

$$\langle\ \text{BEL}\ ,\ \boxed{\begin{array}{c}\\ \hline \text{deer(x)}\end{array}}\ \rangle,$$

$$\langle\ \text{INT}\ ,\ \boxed{\begin{array}{c}\text{e}\\ \hline \text{e: shoot(i,x)}\end{array}}\ \rangle\ \}$$

Legenda: In representations of this sort internal anchors are treated as separate components of the represented attitudinal state. Each representation of an internal anchor specifies in its first component not only that what it represents is an anchor (as opposed, say, to a belief or an intention; this information is given by 'ANCH'), but also which discourse referent that anchor is an internal anchor for. The second component gives information about how the entity represented by the anchored discourse referent is conceived – as the object that is being perceived, in some particular way, and with the properties that are attributed to it as an intrinsic part of the perception. Exactly what information this second component should contain, and in what form, are questions about which I will say next to nothing here. To give a sense of the complexity of this issue let me mention just one particularly problematic case. It concerns the internal anchor for l. The conditions which make up that component should capture the spatial relations between the

location represented by l and the perceiving agent Bill. How agents represent locations in their environment so that they are able to keep track of them when they move around themselves and could find their way to the represented location if and when they want to go there, is a matter with many intriguing cognitive aspects to it, few if any of which have been fully understood. I have finessed this particular problem here by assuming that in the internal anchor for l in (3) all this information is covered by the unanalysed predicate P.[7]

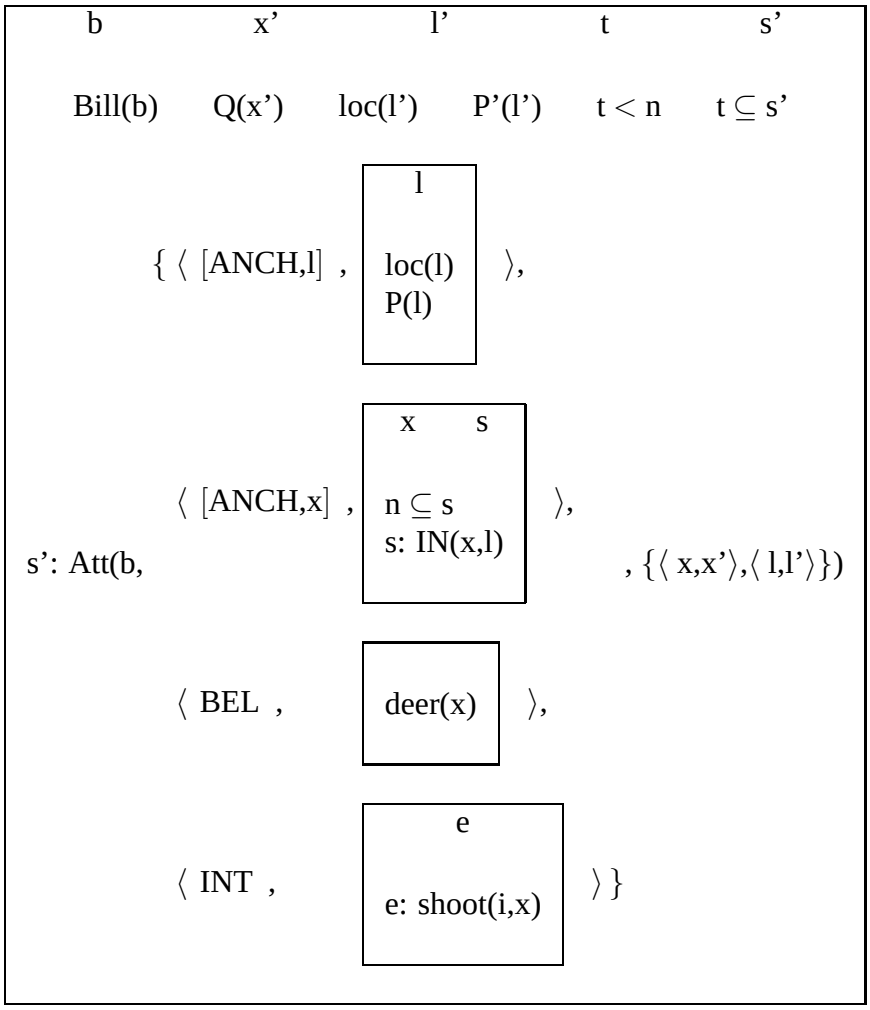
Attitude complexes like the one represented in (3) should be attributable to any agent at any time. So our formalism should have the possibility of expressing who it is that a given attitudinal state is the attitudinal state of, and when this individual is in the given state. In our formalism this is accomplished with the help of a 3-place predicate 'Att', whose arguments are (i) an agent; (ii) a part of the agent's attitudinal state, specified as a set of connected attitudes (e.g. the one given in (3)), and (iii) a set of external anchors for all or some of the internally anchored discourse referents which are part of the second argument. The time at which a given attitudinal complex is being entertained is captured in the way familiar from the treatment of temporal reference in DRT: 'Att' is a stative predicate; thus, any predication involving 'Att' takes the form of a condition 's: Att(α,β,γ)'. This condition says that s is a state which consists in α being in a mental state which minimally contains the components specified in β, and where all or some of the internally anchored discourse referents of β have the external anchors given in γ. The time at which α is in the mental state thus characterised can then be specified via further conditions involving s. In particular, that α was in this state at a given time t can be captured by the condition 't $\subseteq$ s'. Thus, the proposition that Bill was at t in the state described in (3), with external anchors for both x and l, can be represented as in (4), where x' and l' represent (from a perspective external to Bill) the entities to which x and l are anchored.[8]

[7]The question what information should be represented in the content representations of internal anchors has many ramifications. For 'perceptual' anchors, as we find in (3), most of these ramifications are closely related to problems for the theory of direct perception. But as I have proposed elsewhere, internal anchors also arise for discourse referents whose origin is not one of (purported) perception, and the information content of such anchors raises questions of quite different sorts. The general problems of the use and form of internal anchors is closely connected with issues of direct reference, in thought and – derivatively – in language.

A more detailed account of the propositional content of internal anchors is needed before it will be possible to draw a motivated line between information that should be represented as part of the anchor itself and information which should be part of the belief or beliefs that come about as a result of the purported causal relation between the agent and the entity that he takes the anchored discourse referent to represent. In this paper I will distribute information between anchors and beliefs on an ad hoc basis. In some cases the division I adopt may be only one of several intuitively plausible alternatives. The matter will be of no importance to what concerns us in this paper.

[8]From the way in which I described the case represented in (4) the predicate Q cannot be determined. In fact, Q will vary depending on whether we are dealing with a case of possibility (i) or of possibility (ii). In the first case Q will be consistent with the property which Bill attributes to x', whereas in the second case it won't be. (In that case Q could be, for instance, 'i's father-in-law'). In case of possibility (iii) there will be no external anchor for x and thus also no condition involving Q. Given the way in which I have described the mental episode represented in (4) it seems reasonable to assume that irrespective of which of the possibilities (i)–(iii) applies with regard to x, there will be an external anchor l' for l. The predicate P' is to be seen as short for one or more conditions which fix the location l' in terms that are independent of the attitudinal subject Bill.

(4)



3.2 Presupposition

The second DRT extension we will need concerns the treatment of presuppositions. I here give just one example which will indicate the general features of this treatment. The sentence involved in this example – it is given in (5a) – is closely similar to the *that*-complement of the second sentence of (1). Like most sentences of English and other natural languages it generates several presuppositions, and these presuppositions are ordered hierarchically in the sense that some of them presuppose others in their turn. The triggers of the presuppositions of (5a) which are explicitly represented in the preliminary representation (5b) are the following:

(i) The proper name *Mary*.

(ii) The verb *leave*. *Leave* triggers two presuppositions. One of these is connected with the implicit direct object argument of the ostensibly 'intransitive' use of *leave* in (5a). The other presupposition is a "prestate presupposition", an instance of the general kind that is associated with all verbs of change. The prestate of an occurrence of *leave* consists in the subject being in the place that she is described as leaving and the prestate presupposition is to the effect that this state obtains at the start of the leaving event described by the given occurrence of the verb.

(iii) The past tense of *left*. In (5b) I have followed the view according to which certain tense occurrences carry a presupposition to the effect that the time of the described state or event is identifiable from the given context. (One of the intuitions supporting such a presuppositional account of tense is that out-of-the-blue utterances of a sentence like (5a) are perceived as strange or awkward because they lack a context which indicates what event time is intended.)

(iv) Finally, (5a) contains the presupposition trigger *again*. The occurrence of *again* in (5a) is one of those which allows for both a *repetitive* and a *restitutive* interpretation. In (5b) I have opted for the restitutive interpretation, according to which the result state of the described event also held at some time before the event (and the event thus has the effect of 'restituting' that state). In the case of *leave* the restituted state is that of not being in the place that the described event is a leaving from.

(5) a. Mary left again.

b.[9]

$\langle \{$ [$\underline{m}$ | Mary(m)] (prop. name), [$\underline{l}$ | loc(l)] (impl. arg. *leave*), [$\underline{t}$ | $t < n$] (Simple Past), [s^0 | s^0: IN(m,l)] (prest. *leave*), [l' s' | $l' \neq l$, $s' < t$, s': IN(m,l')] (restit. *again*) $\}$,

[e s^1 l" | $e \subseteq t$, $s^0 \supset\!\subset e \supset\!\subset s^1$, e: leave(m,l), s^1: IN(m,l")] $\rangle$

Legenda: The top tier of (5b) consists of the presuppositions of (5a) while the lower tier is the non-presuppositional part. Note that some of the discourse referents occurring in the universes of DRSs which represent presuppositions are underlined. Such underlinings signify that justification of the presupposition involves finding an 'antecedent' for the underlined discourse referent. In DRT terms this means: finding a discourse referent in the context representation with which the anaphoric discourse referent is formally identified. In order that the chosen antecedent provide a proper justification for the presupposition containing the anaphoric discourse referent, the context must entail that it satisfies the condition or conditions contained in the presupposition. Presuppositions without underlined discourse referents have a purely propositional status. Such presuppositions are justified iff the context entails the propositions they express.

All presuppositions in (5b) come with labeling subscripts. These are shorthands for constraints, determined by the type of their trigger, on the form their justification can take.[10] A

[9]("$\supset\!\subset$" denotes *abutment* of two eventualities or periods of time. Thus, for instance, "$s^0 \supset\!\subset e$" means that s^0 ends at the very instant when e begins.)

[10]In particular, constraints on presuppositions with anaphoric discourse referents may specify in what form their antecedents must be available in the context, or may be made available by it: Should the context explicitly contain

proper taxonomy of justification constraints is one of the outstanding problems of current presupposition theory. In what follows I will, with few exceptions, ignore these constraints. In line with this the constraint labels will mostly be omitted.

The effect of presupposition justification on a 'preliminary' representation such as (5b) is that the presuppositions disappear from it, though the contributions they make to the truth conditions of the representation remain in force, since these are now taken over by the context (either as it was given at the outset or altered by accommodation). The non-representational part of the preliminary representation, which is all that remains of the preliminary representation after justification, constitutes the new information which the represented sentence contributes to the discourse.

In (5b) all presuppositions have been collected into a single set. This flat structure ignores presuppositional dependencies between the different presuppositions. Between the presuppositions of (5a) there are several such dependencies. For instance, the discourse referents m, l and t, all of which require resolution in context, also occur as arguments of conditions in the *again*-presupposition; so the m-, l- and t- presuppositions are not only presuppositions of the non-presuppositional part of (5b) but also of the *again*-presupposition, These dependency relations could be made explicit by further structuring of the presupposition set. But for the purposes of this paper there is no advantage in this, and so we will make do with simple set-representations like that in (5b).

Another simplifying feature of our example is that all presuppositions of (5b) are located at the same attachment site of the representation. This entails that when it comes to presupposition justification, all presuppositions have access to the same contextual information. In general this is not so. Preliminary representations may also contain presuppositions that are found in different attachment sites, and the justification of these presuppositions can make use of information that is expressed by parts of the representation that have scope over these respective sites.[11]

4 The Example

4.1 The Representation of the First Sentence of (1)

At last we are ready to tackle example (1). Our central concern will be the interpretation of its second sentence (1.b). The first sentence (1.a) is of interest primarily because of it provides the context for the interpretation of (1.b) and we will pass over most of the questions of detail that arise in connection with the construction of its representation. (However, many of these same questions will also come up when we discuss the second sentence in Sections 4.2 and 4.3. Having read those sections, the reader should be able to fill in most of the details which our analysis of (1.a) in the present section leaves out.)

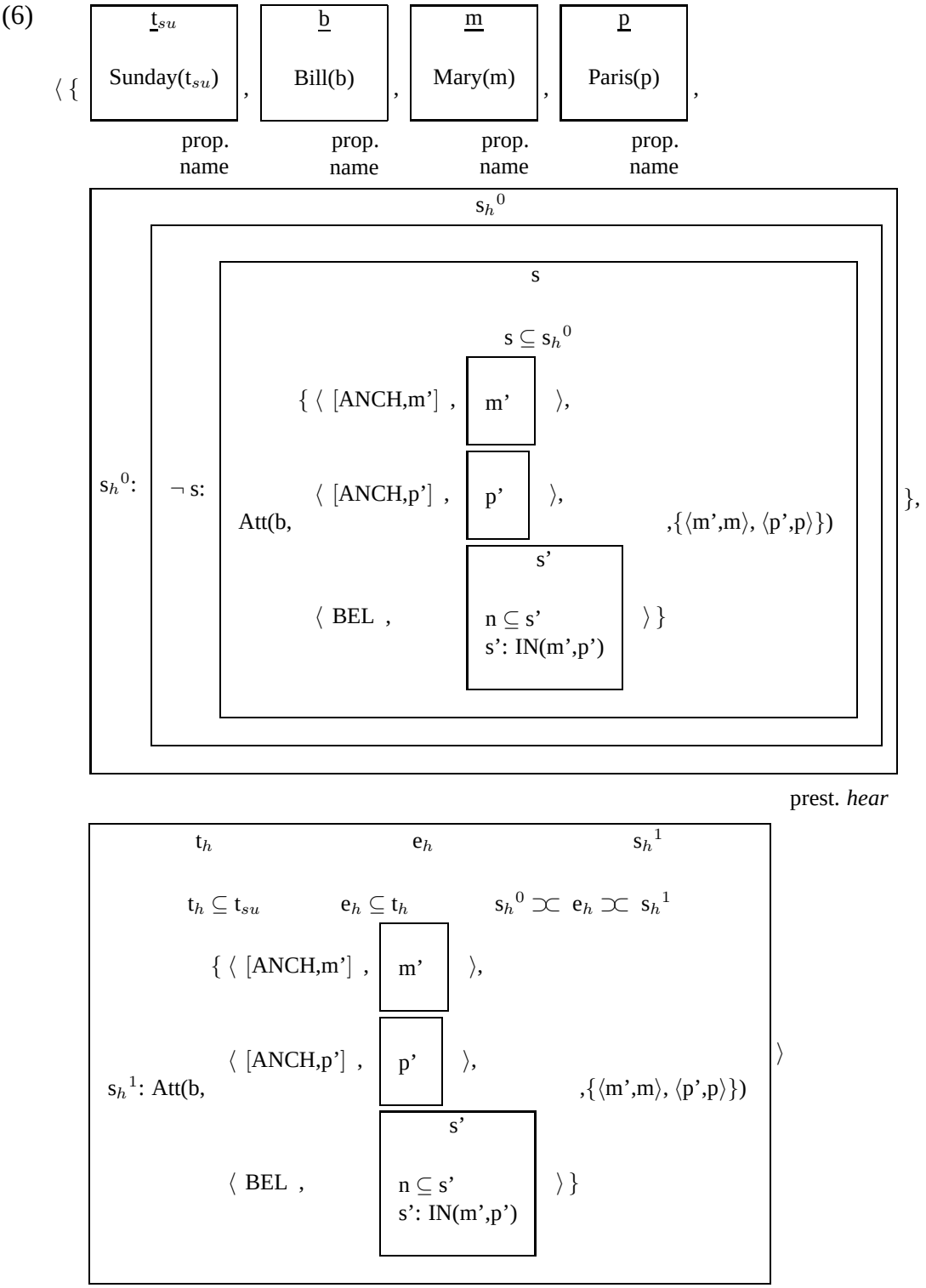
I assume that the preliminary representation of (1.a) is that given in (6).

---

the antecedent as it is given? Or is it enough if it can be expanded with entailments which introduce the antecedent discourse referent? In that case, what kinds of entailments are permitted for this purpose? But these are only some among the many different constraints on presupposition accommodation which our current knowledge of these matters suggests, but most of which have not yet been identified with any precision.

[11] It is along these lines that dynamic theories of presupposition account for projection phenomena: a locally triggered presupposition is not perceived as a presupposition of the entire sentence in which the trigger occurs provided it can be justified on the basis of 'contextual' information provided by the sentence itself. See e.g. Heim (1983); van der Sandt (1992); Beaver (1995/2001) and Geurts (1995, 1999).

(6)



(6) represents Bill as having internally and externally anchored representations for the entities denoted by the proper names *Mary* and *Paris* which occur within the *that*-complement of (1.a) – that part which expresses the information of which (1.a) asserts that Bill acquired it on the given Sunday. This appears to be the only coherent interpretation of proper names occurring inside the descriptions of attitudinal states. It is important to note the difference between the two presupposition-like contributions of these name occurrences to (6). On the one hand they trigger

– like any other occurrences of names, e.g. those of the proper name *Bill* and the name-like NP *Sunday* in (1.a) – the proper name presuppositions that are displayed in the upper tier of (6). But they are special in that they also contribute the mentioned anchors. Put in more general terms: the occurrence of a proper name (or other 'directly referential' NP) in the description of the content of an attributed attitude has two distinct presupposition-like effects:[12]

(i) Like any other occurrence of a directly referential NP it carries the presuppositional requirement that the context provide identification of its referent.

(ii) As an occurrence within an attitude description it attributes to the possessor of the attitude an anchored representation of its referent.

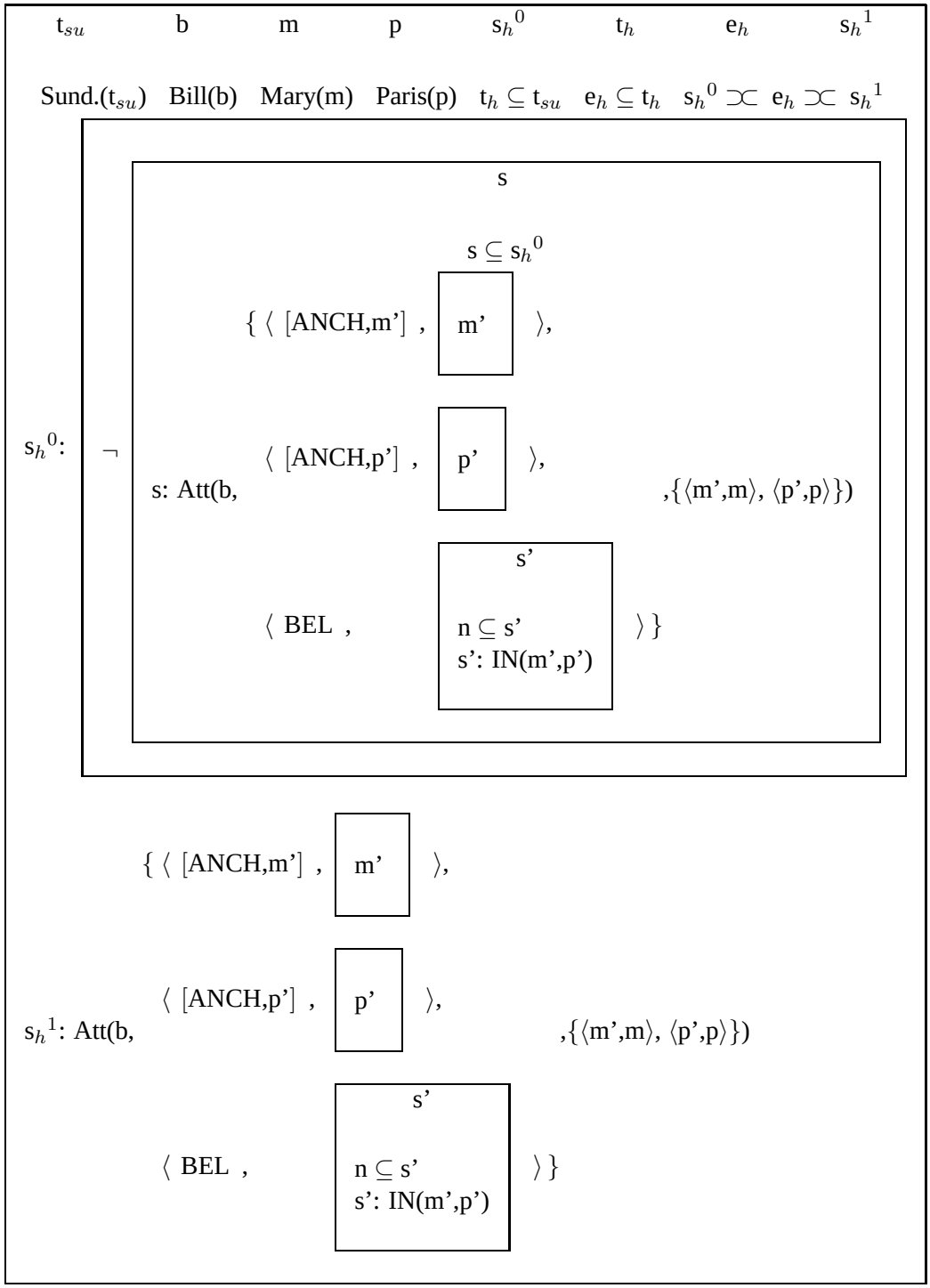
I assume that all presuppositions of (6) can be justified in the context in which (1) is uttered, either directly or after accommodation, and that (7) is the representation which results from their justification. In (7) all information that is represented in the various presuppositions of (6) has been included as non-presupposed (and thus as on a par with the non-presuppositional part of (6)). The motivation is that after justification all information contained in the presuppositions will be available as non-presupposed information, either because it was part of the context already or because it has been made available through accommodation.

I already noted the problems connected with the propositional content of internal anchors. For the present application (as for many others) the exact content of the internal anchors hardly matters. For such applications a notation which abstracts from the content of internal anchors will be adequate. Such an alternative notation can be substantially simpler than the one we have used so far, provided there also is no need to worry about discourse referents which have internal but no external anchors – in other words, if it can be assumed that all internally anchored discourse referents are externally anchored as well. This is an assumption that can be made in connection with our example (1) without giving away anything of what makes the example of interest to us. In this alternative notation anchored discourse referents are eliminated, together with their internal and external anchors, and are replaced by the discourse referents representing the entities to which they are externally anchored. In other words, where the old notation has an anchored discourse referent x' with an internal anchor IA and an external anchor <x',x>, the new notation will have neither IA nor <x',x>, while the occurrences of x' in argument positions of conditions are all replaced by x. The new notation thus permits a discourse referent x which is 'declared' outside an Att-predication – i.e. which occurs in a universe that is not within the scope of the given occurrence of Att – to occur in positions that are part of this predication. The semantic import of such occurrences is essentially the same as the complexes of the old notation

[12]Comparison between (6) and (5b) might seem to show an inconsistency between their respective treatments of the past tense. In (5b) the past tense of *left* was treated as triggering a presupposition that the time of the described event can be identified in context. In (6) no such presupposition appears for either the past tense of the matrix verb or that of the embedded clause. The reasons for this deviation from what was assumed in connection with (5b) are as follows: (i) The main clause of (1.a) differs from (5a) in that it contains a 'locating adverb', viz. the temporal adverbial *on Sunday*. This adverb takes over the task of temporal location of the event described by the verb, which in our analysis of (5a) was left to the context. So the contribution which in (5b) is imposed on the context by the presupposition involving the anaphoric discourse referent t is made in (6) by the condition "$t_h \subseteq t_{su}$". (Of course, the referential NP *Sunday* gives rise to a presupposition of its own, but that is a different matter.) (ii) The tense of the embedded verb *was* is treated as anaphoric to that of the matrix verb. (See the references mentioned in fn. 5). In a more detailed analysis this anaphoric connection might be initially represented as involving a presupposition as well. For reasons of simplicity I have suppressed this further complication here.

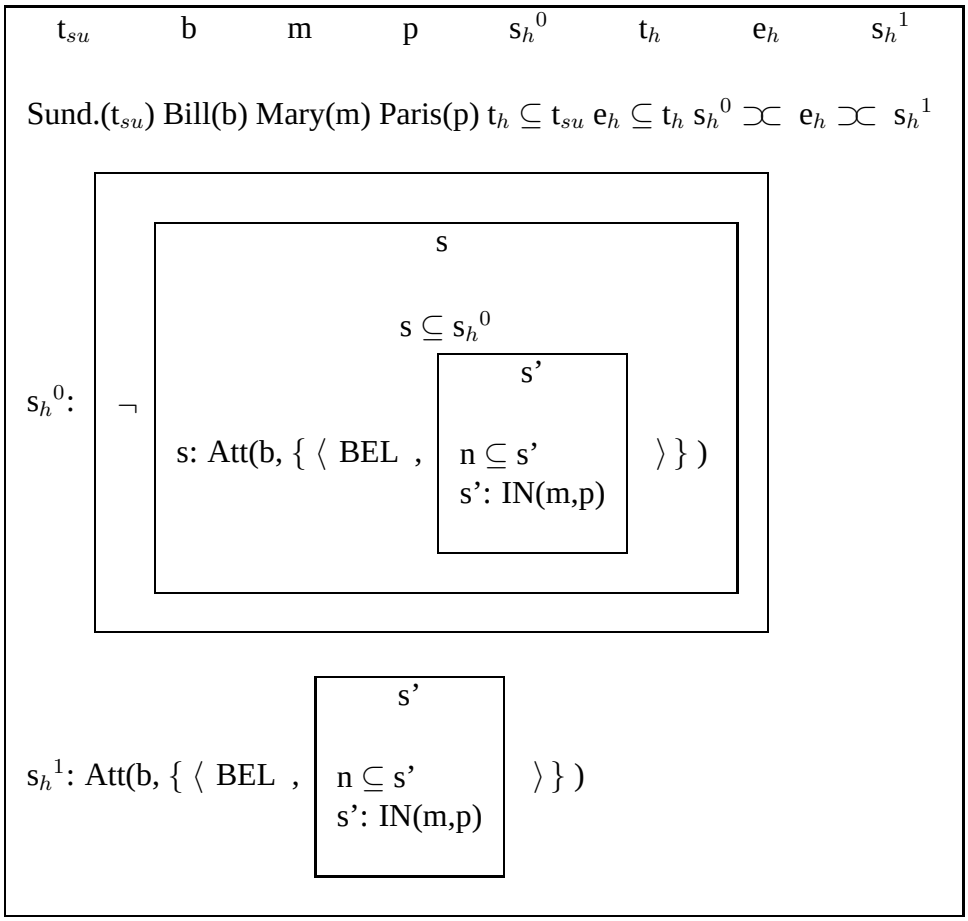
which they replace: Any attitude whose content representation contains occurrences of discourse referents that are declared in positions external to it is to be understood as determining a singular propositional content, which is *de re* with respect to the entities represented by these discourse referents.

(7)



Using the new notation we can simplify (7) to (8).

(8)



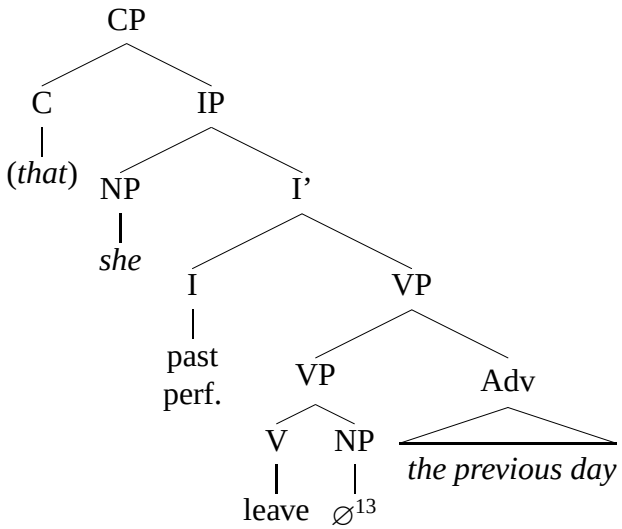
4.2 An interpretation for the *that*-complement of (1.b)

The *that*-complement of the second sentence of (1) is repeated in (9):

(9) (that) she had left the previous day

I assume the following syntactic tree for (9):

(10)



Our next task is to construct a preliminary representation of (9) on the basis of (10). More accurately, we will construct a semantic representation for the subtree of (10) whose root is the IP *she left the previous day*. As always when semantic representations are constructed from syntactic trees, the construction requires lexical entries for each of the words and semantically relevant features that occur at the leaves of the tree. So we begin by listing these entries. In doing so we follow the left-to-right order in which the lexical items occur in the IP of (10).

Our first item is the pronoun *she*. The entry which we will use is given in (11.a):

(11) a. $\langle$ *she*, NP $\rangle$

α

$\langle \{ \boxed{\begin{array}{c}\underline{\alpha} \\ \text{pers}(\alpha) \\ \text{fem.}(\alpha)\end{array}}_{\text{pron.}} \}$, '$\lambda$P.P($\alpha$)' $\rangle$

A few comments before we proceed to the next entry. The upper tier of (11.a) states that *she* is an expression of category NP and that it introduces some discourse referent α. The semantics is given in the lower tier. It consists of a representation that is composed of (i) a set consisting of a single presupposition, and (ii) a non-presuppositional part. The presupposition is anaphoric with respect to its anaphoric discourse referent α which represents the pronoun's referent, and requires of α's antecedent that it be a female person. (We ignore the complications connected with the possibility of using English *she* to refer to ships, mares and certain other kinds of non-persons.) The subscript 'pron.' is short for constraints on the possible resolutions of personal pronouns. (Compare the remarks in 3.2.)

The non-presuppositional part of the semantic tier of (11.a) is a shorthand for something more complicated. The story that it abbreviates is too long to tell in full here. Since it is of marginal relevance to the central issues of the paper, I confine myself to a few hints. The condition "λ P.P(α)" as non-presuppositional component of the semantics of referential NPs such as pronouns would be just what is wanted in a theory of semantic form construction which treats the combination of a noun phrase and a predicate to which it is an argument as involving a succession of two λ-conversions, in the manner first proposed by Montague. In a theory of this form the meaning of the sister node of the NP-node (i.e. the node of the predicate which has the NP for an argument) would be assigned a semantics of the form $\lambda\beta$.K(β), with β a variable of the same type

[13] In (10) the 'intransitive' use of *leave* in (9) has been analysed as one that is syntactically transitive but involves a direct object that is phonologically null. At least on one occasion when I presented the material on which this paper is based this analysis has met with opposition. The opposition may well be justified: It may be that on balance we will obtain a better over-all theory of the syntax and semantics of 'intransitive' uses of verbs which also allow for a corresponding transitive use if we assume that these uses are genuinely intransitive in the sense that there is no direct object node in the syntactic structure of the clauses containing them. For my present purposes this question is not important. Anyone who prefers a syntactic analysis for (9) without a direct object node will find no difficulty in restating what I will have to say about the sentence below in a form which fits such an analysis.

Another decision which I have made here and which may offend syntactic persuasions is to describe the arguments of verbs (and other lexical predicates, although these play no role here) as 'NPs' rather than 'DPs'. In fact, the nomenclature matters little here since the internal structure of such phrases plays no role in the problems we will be discussing.

as α and $\lambda\beta$.K(β) of the same type as P. Such an account works fine so long as the outermost λ-bound variable in the semantic form $\lambda\beta$.K(β) of the sister to the NP node can be counted on to occupy within K the argument position of the NP. Making sure that this is always so can be awkward, however, especially for languages in which there is much variation in clause-internal word order and argument phrases often occur in positions other than their 'canonical' or 'base' positions. Some form of *linking theory* is required (most evidently in such languages but also in others) to determine which NPs fill which argument slots of the predicates with which they cooccur. Once such a linking theory is in place, it can be (and has to be) used as a guide in the construction of semantic representations to determine in which slot of the argument frame of the predicate we should insert the variable (or discourse referent) that is introduced by the NP. Under such conditions it proves more convenient to represent the semantic contribution of the sister nodes of NPs as involving stores which hold the argument positions of the represented predicate that still have to be filled and to describe the operation which combines the two contributions as involving the insertion of the discourse referent (or variable) introduced by the NP into the argument slot indicated by Linking theory, while removing the slot that is thereby filled from the store. A detailed account along these lines requires a fully explicit syntax as well as an explicit semantics. Sketches of a DRT-based syntax-semantics interface in which linking theory plays the indicated part can be found in several places, among them Kamp & Roßdeutscher (1994) and Kamp (2001a).[14]

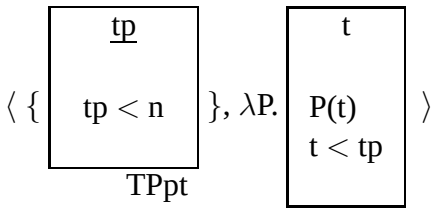
Our next entry is for the past perfect. I have opted here for a treatment of the past perfect as a single tense form, instead of analysing it into smaller components (e.g. as the combination of a perfect operator and a simple past tense). The semantics of the past perfect proposed in this entry is based on the proposal for the essentially Reichenbachian treatment of the English tenses that can be found in Kamp & Reyle (1993), according to which the past perfect locates the predication expressed by the verb whose tense it is as having occurred at a time which is in the past of some "T(emporal) P(erspective) point"[15] and where this TP point is itself situated in the past of the speech time n. The account assumes that the interpretation of an occurrence of the past perfect requires finding a suitable past time in the context which can play the role of TP point and then locating the predication as lying somewhere in the past of that time.[16] Thus the status of the TP point is presuppositional. The subscript "TPpt" in the entry (11.b) stands for special constraints to which the choice of TP points is subject.

[14]Had I assumed a syntax-semantics interface in which predicates and their arguments are combined in the manner of Montague the scare quotes around "λP.P(α)" would have been unnecessary. Their presence is to remind us that the intended interface is strictly speaking not of this form. (I haven't bothered with scare quotes in the λ-terms in the following entries, even though similar caveats apply to their use in DRS construction. An elegant solution to the problem of "getting inside" a sequence of operators which prefixes a matrix representation is developed in Dekker (1993) within his version of Dynamic Semantics. But this is not the place for trying to adapt his ideas to the DRT-framework we are using here.

[15]In this analysis of the past perfect the Temporal Perspective point plays the same role that is played by what Reichenbach (1947/1993) calls "Reference Time" in his account of the past perfect.

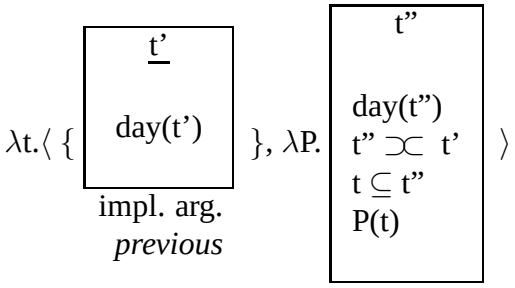
[16]This formulation fails to account for complications having to do with "sequence of tense"; since these are irrelevant to this paper, they are being ignored.

(11) b. ⟨ *past perfect*, VP-predicator ⟩



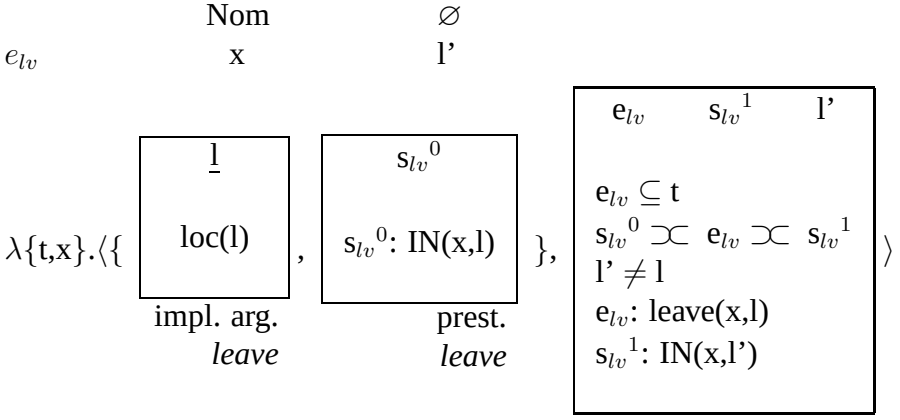
To simplify matters further we also treat the temporal adverbial *the previous day* as if it were an indivisible lexical unit, instead of analysing it as a complex expression with internal semantic structure (i.e. as a definite description with *day* as its nominal head, modified by the prenominal adjective *previous*).[17] One important feature of the semantics of this phrase is the implicit argument of *previous*: In order to interpret an occurrence of this adverbial it is necessary to recover a day *d* from the context so that the referent of *the previous day* can be identified as the day immediately preceding t. Thus the semantics of *the previous day* also involves a presuppositional component, connected with this implicit argument.

(11) c. ⟨ *the previous day*, VP-operator ⟩



Our last entry is that for the verb *leave*. We only specify a semantics for the intransitive use of *leave* which is found in (9). (A general entry would contain this use as one among several alternatives, with varying argument frames and varying meanings.) This 'intransitive' use comes with two presuppositions: (i) the prestate presupposition which this use of *leave* shares with its other uses (and, speaking more generally, with other change-of-state verbs) and (ii) the presupposition connected with its implicit argument.

(11) d. ⟨ *leave* (intr.) V ⟩



[17] For a discussion of temporal definite descriptions like this one, which takes the compositional aspect of such phrases seriously, see Kamp & Schiehlen (2002).

(12) presents the semantic representations of the complex nodes of the IP of (10). We proceed bottom-up, from the representation for the lower VP node in (12.a) to that of the IP node in (12.d).

(12) a. lower VP node:

$\lambda\{t,x\}.\langle\{$ [l : loc(l)] impl. arg. *leave* , [$s_{lv}^{\,0}$: $s_{lv}^{\,0}$: IN(x,l)] prest. *leave* $\}$, [e_{lv} $s_{lv}^{\,1}$ l' : $e_{lv} \subseteq t$; $s_{lv}^{\,0} \supset\!\subset e_{lv} \supset\!\subset s_{lv}^{\,1}$; l' ≠ l; e_{lv}: leave(x,l); $s_{lv}^{\,1}$: IN(x,l')] $\rangle$

b. upper VP node:

$\lambda\{t,x\}.\langle\{$ [t' : day(t')] impl. arg. *previous* , [l : loc(l)] impl. arg. *leave* , [$s_{lv}^{\,0}$: $s_{lv}^{\,0}$: IN(x,l)] prest. *leave* $\}$,

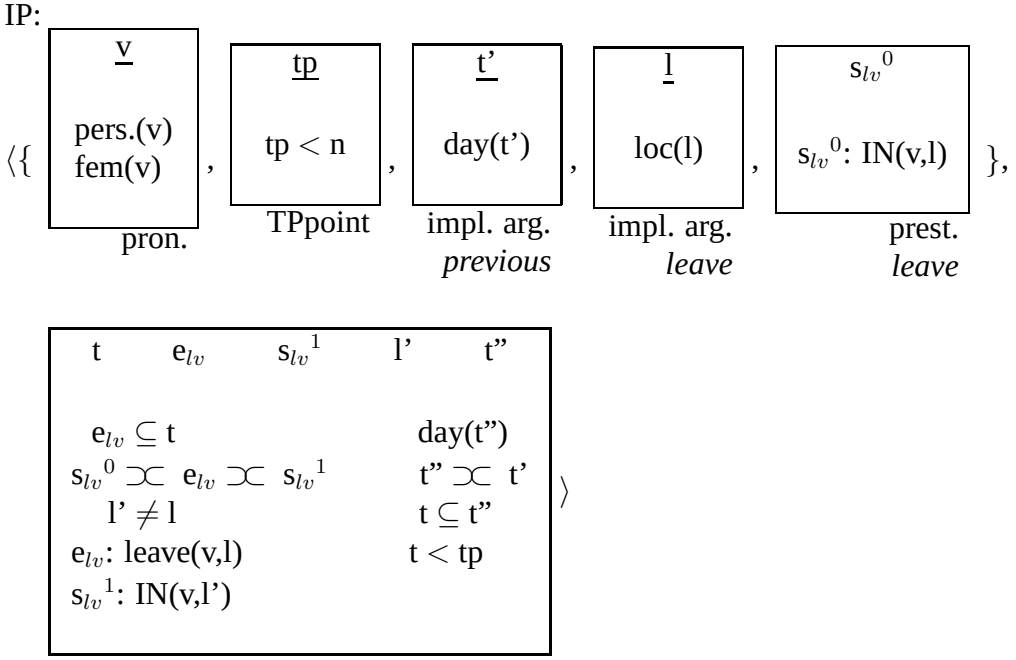
[e_{lv} $s_{lv}^{\,1}$ l' t" : $e_{lv} \subseteq t$; $s_{lv}^{\,0} \supset\!\subset e_{lv} \supset\!\subset s_{lv}^{\,1}$; l' ≠ l; e_{lv}: leave(x,l); $s_{lv}^{\,1}$: IN(x,l'); day(t"); t" ⊃⊂ t'; t ⊆ t"] $\rangle$

c. I':

$\lambda x.\langle\{$ [tp : tp < n] TPpoint , [t' : day(t')] impl. arg. *previous* , [l : loc(l)] impl. arg. *leave* , [$s_{lv}^{\,0}$: $s_{lv}^{\,0}$: IN(x,l)] prest. *leave* $\}$,

[t e_{lv} $s_{lv}^{\,1}$ l' t" : $e_{lv} \subseteq t$; $s_{lv}^{\,0} \supset\!\subset e_{lv} \supset\!\subset s_{lv}^{\,1}$; l' ≠ l; e_{lv}: leave(x,l); $s_{lv}^{\,1}$: IN(x,l'); day(t"); t" ⊃⊂ t'; t ⊆ t"; t < tp] $\rangle$

d. IP:



I have refrained from stating the composition principles according to which these representations are obtained from those of their daughter nodes and refer the reader to relevant literature.[18]

(12.d) will be used as representation of the complement clause of (1.b) when we construct its preliminary representation in the next section.

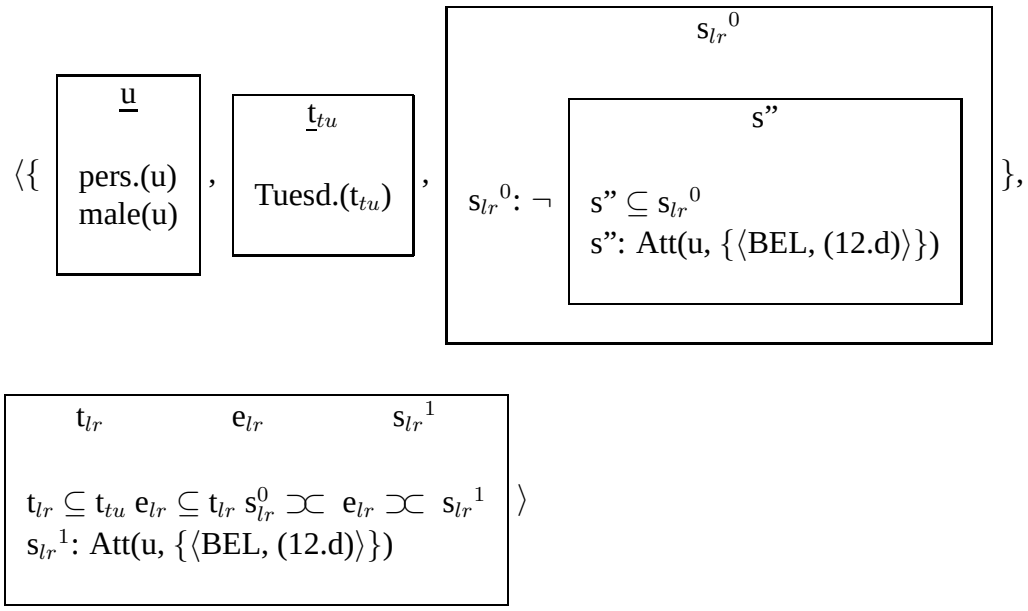
4.3 Preliminary representation of (1.b) and its resolution

The preliminary representation for (1.b) has the same general form as that for (1.a). Once again we are dealing with a sentence which reports a change in Bill's attitudinal state. So once again the representation of the *that*-clause, i.e. (12.d), enters into the representation at two places – into the representation of the belief that is part of Bill's resulting attitudinal state and into the representation of the prestate of *learn*, which consists in Bill not holding that belief.

I will forego the syntax-semantics interface details involved in obtaining this preliminary representation. The remaining steps which lead from the representation (12.d) of the embedded IP to that of the full (1.b) involve little that has not yet been illustrated in the construction of (12.d). There is one exception, viz. the binding of the embedded tense by the tense of the matrix verb. But as announced in Section 2, this is an issue where I am relying entirely on existing work of others and a proper exposition of how the embedded tense is bound by the matrix tense according to any of the existing proposals would involve us in much extra detail that would detract from our real concerns. So u have decided to let this matter rest, and we proceed straight to the preliminary representation of (1.a).

[18]There is to my knowledge no place in the existing literature where these principles are given in exactly the form in which they are needed here. Discussions of similar principles can be found in Kamp (2001a).

(13)



(13) has explicit representations of a total of eight presuppositions, the three displayed in (13) itself and the five of the embedded (12.d).[19,20] It is important to note that the presuppositions are found in two different attachment sites. For justification of the three displayed in (13) the only contextual information available is the primary context provided by (8). In contrast, the justification of the five presuppositions of (12.d) may resort to 'secondary' context information as well. However, as noted in Section 1, the question how (8) can provide the needed secondary context information is one of those which embody the interest which (1) holds for us and which we will have to look into carefully.

Six of the eight presuppositions of (13) are anaphoric, with the anaphoric discourse referents u, t_{tu}, v, tp, t' and l. For two of these, u and v, the context (8) offers only one possible resolution:

[19]Note well that we are dealing with 8 presuppositions, not 13. The fact that (12.d) occurs in (13) in two different places does not mean that it introduces 2 x 5 presuppositions into (13). Since the two occurrences of (12.d) in (13) stem from the same constituent of (1.b), each of (12.d)'s presuppositions counts as only one, which demands a single resolution. In particular, there must be single resolutions for the anaphoric discourse referents in these presuppositions, with antecedents which provide a justification of the presupposition in question that are valid for both positions in which it occurs. In fact, the matter is more complicated than this description suggests. For more on this see Kamp (2001a).

[20]It could be argued that there is one presupposition of (1.b) which (13) fails to display. The verb *learn*, it might be said, is factive in the sense that the new information which *learn* describes its subject as getting is presented as true (or 'as fact'). Factivity of stative attitude verbs such as *know* or *regret* is widely regarded as presuppositional, and much the same considerations that have been adduced in support of that view equally support a presuppositional treatment of the factivity of the 'inchoative' epistemic verb *learn*. Personally I am inclined to think that *learn* is factive, but have nevertheless chosen to ignore this aspect of its semantics here.

The factivity of *learn* is connected with another aspect of its meaning. "x learns that p" seems to entail that the information that p did not just become available to x, but that x accepted this information, adopting the belief that p is true. In my analysis of (1) I have assumed this acceptance aspect as part of the meaning of *learn*. It could be argued that the acceptance aspect of *learn* and its factivity go hand in hand. If that is so, the policy I have adopted here – of taking the one aspect on board but not the other, is of course not quite right. But it is a decision which has no serious consequences for the issues that concerns us.

The factivity issue might have been raised also in connection with the verb *hear* as it occurs in (1.a). According to my own intuitions *hear* (in the sense of 'come to be informed about' in which it is used in (1.a)), is less clearly factive than *learn*, but quite possibly it has a factive use as well.

(i) u := b; (ii) v := m;

The story about the other four is a little more complicated, and it is a somewhat different story for each. First t_{tu}: Adverbial uses of names of days of the week, such as that of *Sunday* in (1.a) and of *Tuesday* in (1.b), are anaphoric in roughly the following way. The interpretation of such a name occurrence involves the identification of some other day *d* which can serve as the 'origin' from which the reference of the given occurrence can be computed. The day referred to by the name is then either the first day after *d* that fits the name (e.g. the first Tuesday after *d*) or the last one before d. Which of these two is the intended referent depends on further factors, from which it is possible to tell whether the state or event described by the clause in which the name occurs is located after *d* or before it. Often the origin is the day of the utterance time. But it can also be some other contextually salient day. In the case of the *Tuesday* of (1.b) the natural choice for *d* is the Sunday referred to by *Sunday* in (1.a).[21] (What day that is, is yet another question. It is one which we passed over when discussing the interpretation of (1.a), and it is a matter which cannot really be settled, the interpreter of (1) must simply accommodate the referent by assuming that whoever produced (1) must have been talking about some particular Sunday.) I am assuming further that the event described in (1.b) follows the one described in (1.a).[22] On these assumptions the referent of *Tuesday* is the Tuesday immediately following the day referred to by *Sunday* in (1.a), and that is what we will take it to refer to throughout the remainder of the paper.

Next the location discourse referent l. It might easily appear as if its resolution is as predetermined as those of u and v; for these cases are similar in that for each of these three discourse referents there is exactly one antecedent in the discourse context. In the case of l this is p, the only discourse referent in the discourse context representation (8) which satisfies the constraint that what it represents must be a location. Indeed, p seems a natural resolution for l – in other words, the leaving spoken of in (1.b) is a leaving from Paris – and that is the resolution which I will assume in this section. However, in Section 4.4 we will see that this is not the only possible interpretation for l.

Two anaphoric discourse referents remain, tp and t'. For these resolution is not unequivocal either. t' could be resolved either to t_{tu} or to t_{su}. And in case t' is resolved to t_{su}, tp could also be resolved to either t_{tu} or t_{su} (although this latter choice makes no difference to the resulting sentence interpretation). In this section we focus on the option of resolving t' to t_{tu}. This means that *the previous day* is interpreted as referring to the day immediately before the day represented by t_{tu} – in other words, to the Monday between that Tuesday and the Sunday represented by t_{su}. In this case the only coherent resolution for tp is that which identifies it also with t_{tu}.

With these additional decisions our resolution set is extended to:

(iii) t_{tu} := "the Tuesday immediately following t_{su}";
(iv) l := p;
(v) t' := t_{tu};
(vi) tp := t_{tu}.

[21] For some more discussion on this see Kamp & Schiehlen (2002).

[22] This interpretation is strongly suggested by the tenses of the matrix verbs in (1): the succession of the two simple past tenses *heard* and *learned* of (1) carries a presumption that the event of the second sentence followed that of the first. But many discussions in the literature show how delicate these matters can be. See Lascarides & Asher (1993); Asher & Lascarides (2003).

4.4 Other possible Interpretations of (1)

Before we enter more deeply into the reconstruction of the interpretation determined by the resolution equations (i)–(vi), we will quickly review what other interpretations are possible for (1). In doing that I will not question the interpretation of (1.a) given in (8), but only look at alternative interpretations of (1.b) relative to this interpretation of (1.a). About these alternative interpretations I will have nothing more to say in the sequel. So the reader who isn't particularly interested in this matter and more concerned not to lose the thread of the main argument of this paper, can skip this section and move straight to 4.5.

We noted that for some of the anaphoric discourse referents of the preliminary representation of (1.b) the context that is provided by (1.a) offers only one possible resolution. For *he* it is 'Bill', for *she* it is 'Mary' The matter of *Tuesday* is more complicated. I do not think that interpretations other than the one we have been considering can be excluded absolutely. It seems just possible to interpret *Tuesday* as referring to the last Tuesday before the utterance time in cases where that is a different Tuesday from the first one after the Sunday that was mentioned in the first sentence. (Note that when *Sunday* in the first sentence is itself interpreted as the last Sunday before the utterance time, and the utterance time is later in that week – e.g. on Friday or Saturday – then this second interpretation of *Tuesday* will *de facto* coincide with the one assumed in Section 4.3.) A second possibility would be for Tuesday to refer to the Tuesday immediately before the Sunday of the first sentence. As we noted in 4.3, this interpretation is not a very likely given the tenses of the two matrix clauses. But again, it is difficult to exclude it categorically. Since these interpretations seem so marginal, however, I won't consider these possibilities further.

I already mentioned in 4.3 an alternative interpretation for *the previous day*. On this interpretation the phrase would refer not to the day before Tuesday but to the day before Sunday. In order that this option lead to an intelligible interpretation we need a different resolution of the implicit location argument l of *leave*: When the leaving took place the day before Mary was in Paris, then presumably it was not a leaving from Paris but a leaving for Paris, and thus the place that Mary left must have been a place that is different from Paris. Since no place other than Paris has been mentioned, such a resolution of l requires accommodation. It should be stressed in this connection that there are not just speakers for whom this second interpretation of (1) is possible, but even some for whom it is the more salient one. One important implication of this is that the principle, to my knowledge first stated explicitly in van der Sandt (1992), that resolutions of anaphoric discourse referents which do not involve accommodation – cases of *binding* in van der Sandt's terminology – have preference over resolutions which require it cannot be universally valid in this simple form. (Cf. Beaver 1995/2001, 2005) for earlier indications that there is more to this principle than the simple formulation suggests.) There is no doubt that something like this principle must be true, but evidently a more refined formulation is needed. Such a refined formulation will have to pay attention among other things to the types of different anaphoric presupposition triggers. In particular, a distinction will almost certainly have to be made between overt pronouns and implicit arguments such as that of intransitive *leave*. (See also the remarks in Section 3.2 on trigger-dependent rules of presupposition justification.) In my estimation this exhausts the range of interpretations for (1.b).[23]

[23]Claims of this sort are notoriously prone to error – one always has to be wary of special contexts, which would open the way to other interpretations, but which are so unusual that a normal interpreter would not assume them unless the context was explicitly presented to him. Actually demonstrating that a given set of readings exhausts the interpretational possibilities for a given sentence or discourse on the basis of theoretical assumptions is almost

4.5 Assumptions about the persistence of other agents' beliefs

I will take it for granted that the resolutions (i)–(vi) yield full justifications for the presuppositions that contain the discourse referents for which they provide anaphoric discourse referents, i.e. that (8) entails each of the conditions that are contained in these presuppositions when the anaphoric discourse referents are replaced by their chosen antecedents. This leaves us with two remaining justifications, for the non-anaphoric pre-state presuppositions of *learn* and *leave*. It is the justification of the second of these presuppositions, the prestate presupposition of *leave*, which brings into focus those issues which motivated the choice of (1), and it is to this justification that the remainder of this section and all of Section 4.6 will be devoted. Once the justification of this presupposition is in place, the justification of the prestate presupposition of *learn* will be unproblematic.

Given the resolution of v to m and of l to p, the prestate presupposition of *leave* says that Mary was in Paris immediately before the occurrence of the leaving event described in (1.b). We should keep in mind, however, that neither the event nor its presupposition are presented as mere facts but as contents of Bill's belief state. Contextual information which justifies the prestate presupposition must therefore also be information about Bill's belief state, and it must be information about his belief state just before the time when on Tuesday he learned about Maria's leaving. But as things stand (8) provides no direct information about Bill's beliefs at that particular time. The attitude which (8) does ascribe to Bill is a belief which he holds as a result of the event of his hearing on Sunday about Mary being in Paris. Since it was the result of that event, Bill must have had it for at least some time on Sunday. But how long Bill stuck to this belief is something about which the interpreter has no direct information. However, beliefs, like many other propositional attitudes, have a tendency to persist, and so it is a natural assumption that Bill is still in this belief state when the new information reaches him on the following Tuesday. In fact, this assumption is so plausible that an interpreter of (1) would hardly be aware that he was making it. We will see presently that it doesn't really solve the justification problem posed by *leave*'s prestate presupposition, but it is a natural assumption nevertheless and it appears that a discourse like (1) exerts a strong pressure on the interpreter to make it.

The assumption that Bill's belief about Mary's presence in Paris persists until Tuesday may seem innocent enough at first sight; but what really does this assumption amount to? What *is* the belief about Mary that is supposed to have persisted until the time when Bill got the new information on Tuesday? There are two different ways in which the persistence of Bill's belief about Mary being in Paris can be construed. One possibility is that Bill retains the belief that Mary was in Paris at the time when he was informed about this, i.e. the belief that Mary was in Paris on Sunday. But it is also possible for the belief to have persisted as the belief of Mary being *currently* in Paris. The difference between these two forms of persistence is as important as it is evident. From a truth-conditional perspective persistence of the second kind isn't persistence in the strict sense of the word. As noted in Section 2.1, the truth-conditional content of a belief about what is currently the case evolves with the time at which the belief is entertained. For instance, on Sunday the content of Bill's belief that Mary is currently in Paris is the proposition of Mary being in Paris on Sunday, whereas the content of the "same" belief on Tuesday is that of Mary being in Paris on Tuesday. Note, however, that in the representational format we have been using this evolution of truth conditions goes hand in hand with invariance of representational

always very hard, and well beyond our current capacities. So, as things are, such claims have to be handled with the greatest circumspection.

form. For it is the same content representation, repeated in (14), which carries these different truth conditions depending on whether it represents a belief entertained on Sunday or a belief entertained on Tuesday.

(14)

s’
n $\subseteq$ s’ s’: IN(m,p)

As opposed to this second kind of persistence, the first kind of persistence we mentioned is one which succeeds in preserving truth-conditional content of the belief that Mary was in Paris on Sunday. But this stability of truth conditions can, in the given case, only be achieved at the cost of a change in representational form: If we assume that Bill initially represented the belief he acquired on Sunday in the form in which it is given in (8) and repeated above as (14), its representation must have changed in the meantime if it is still to represent, when entertained at the later time on Tuesday, the proposition that Mary was in Paris on Sunday. In the abbreviated notation we first used in (8) and have been using since, the new, truth condition preserving representation can be presented in a pleasingly compact form:

(15)

t’	s’
t’ $\subseteq$ t_{su} t’ $\subseteq$ s’ s’: IN(m,p)	

In this particular instance, however, we do well to remind ourselves of the abbreviatory nature of this notation. As the representation of a propositional attitude, (15) conceals the internal and external anchors that would be explicitly represented in the earlier notation. A representation in that notation would have displayed among other things an internal anchor for a discourse referent t'_{su} together with the external anchor $<t'_{su},t_{su}>$. So there is more to the transition from the belief represented in (14) to the one represented in (15) than meets the eye in a superficial comparison of (15) and (14).

Yet we must be careful not to overstate this point. It is likely that Bill has an anchored representation for the mentioned Sunday, and quite possibly also one for the particular time on that Sunday when he got the information about Mary being in Paris. In that case most of what is needed to realise the transition from (14) to (15) is already in place and all that remains is to change the indexical link of the state s’ to the time n by the non-indexical link to the anchored representation of the given Sunday (or of the particular time on Sunday when Bill’s first belief change occurred).

For the interpreter of (1) there is no conclusive way of telling which of the two persistence assumptions about Bill’s belief is the (more) appropriate one. In the next section we will spell out the implications of either option. I will use the remainder of the present section for two rather speculative remarks on the reasons why and the ways in which beliefs about the current state of the world are transformed into beliefs about what the world was like at some earlier time. First,

an observation that goes back more than two decades and probably more:[24] The time it takes for the belief that a certain condition currently obtains to be transformed into the belief that this condition obtained at some earlier time (where this earlier time may be fixed with more or less accuracy) will vary as a function of what the condition is. When I observe that there is a dead blackbird lying on the roof and form the corresponding belief that this is currently the case, then this belief is likely to survive for longer than when I observe that there is a living blackbird sitting on the roof. We humans are equipped with elaborate networks of expectations as to how long different conditions are likely to last (in various circumstances) and these expectations guide us in our doxastic behaviour. And the longer the 'life expectation' we associate with a given condition, the longer it will take for us to abandon the belief that the condition currently obtains after we found out about its obtaining. And what is true for our own beliefs about such conditions also applies to our expectations about the doxastic behaviour of others. For instance, had the first sentence of (1) spoken of Mary being in the kitchen rather than in Paris, we would be much less inclined to make the assumption that Bill maintained his belief that she was still there until Tuesday.[25]

The second observation concerns the notion of doxastic strength. Some beliefs are held more firmly than others – we are more resistant to giving them up in the light of contrary evidence, we attach higher probabilities to their propositional contents, we are prepared to place higher stakes on outcomes which depend on their being true, etc. (I do not mean to imply that all these criteria must necessarily coincide in what they tell us about the degrees of confidence of which they are the supposed manifestations, but they are all important.) Once we are prepared to distinguish between different degrees of doxastic strength, we are in a position to distinguish between instantaneous transitions form beliefs about current states to beliefs about past states and transitions which are gradual. In particular, it is now possible to conceive of Bill's belief that Mary is currently in Paris as involving, over the period from Sunday till Tuesday, a gradual decay rather than a sudden switch from belief to non-belief. In fact, the more plausible picture would now be that Bill's belief that Mary is currently in Paris coexists with his belief that she was in Paris at the time when he was informed about this on Sunday and that the strength of the former slowly decays while the latter continues in full force.

Taking degrees of doxastic strength into account would arguably lead to a deeper and more natural analysis of the interpretation of (1) than I am able to give in this paper. But degrees of belief cannot be represented in the formalism we are using and to modify the formalism so that variations of doxastic strength can be adequately represented is a non-trivial matter. There is no question of developing such a modification here and all I can do is leave this as a task for the future.[26]

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[24]Early work on this topic of which I am aware is that of D. McDermott. But I suspect that in AI and/or in the Philosophy of Mind an awareness of the importance of this factor may go back to an even earlier date.

[25]It is worth noting that this variant of (1) has a peculiar ring to it. Apparently the form of (1) impels the interpreter to assume that the current state belief acquired on Sunday persists until the time of the belief change on Tuesday. For the just mentioned variant the persistence of this belief over a period of the given duration is inherently less plausible than it is for (1) itself and this seems to be the reason why the variant sounds odd in a way that (1) does not. See also Section 4.7.

[26]One possibility which comes to mind is that of extending the formalism with an open-ended set of doxastic indicators '[BEL, μ]' where the μ are terms denoting measures of the doxastic strength. (The measures might be real numbers, but they could also belong to some other type of confidence scale.) The further question then is what kinds of terms should be admitted in the extension. In order to state general hypotheses about the decline of belief strength over time it would seem desirable to admit variables ranging over the confidence scale. A further question

I should add that I am not persuaded that matters of doxastic strength are essential to the *semantics* of discourses like (1), even if it is relevant to the extra-linguistic reflections that their semantic representations are likely to set in motion. The reasons for these doubts will become visible in section 4.7.

4.6 Implications of the two Persistence Assumptions

Let us assume that both persistence hypotheses we discussed in the last section – the hypothesis that Bill's belief at the relevant time on Tuesday has the content given by (14) and the hypothesis that it has the content given in (15) – are possible accommodations which an interpreter might entertain in his attempt to make sense of (1.b). For all that has been said so far, either one is a candidate. But which one the interpreter adopts makes a good deal of difference to how he will understand what happens when Bill learns about Mary's departure.

First consider the assumption that Bill retained the belief he formed on Sunday in the form given in (14). Then the new information he received on Tuesday was in contradiction with what he believed at that time. For he still believed that Mary was in Paris, which is obviously inconsistent with the discovery hat she left Paris the day before. So the interpreter who assumes Bill's belief to have persisted in this form must also assume that the new information which Bill got on Tuesday led him to a belief *revision*: Apparently Mary left earlier than Bill thought. So that thought had to be given up and replaced by one which is compatible with the new information. Note well, though, that the new belief state which results from this revision still involves persistence of the condition represented in (14) in a more limited form. If Mary left Paris on Monday then she must have stayed in Paris until some time on Monday. Thus (14) remained true until some time on Monday, rather than becoming false already on Sunday, which would have been possible too.

It should be emphasised that the belief revision of which we have spoken is a revision of Bill' beliefs, not of the assumptions made by the interpreter. It is Bill who is forced on Tuesday to abandon the belief of the form (14) which he held until then and to replace it by the belief that Mary remained in Paris only until some time on Monday. Only if the interpreter himself were to assume, on the strength of his interpretation of (1.a), that Mary was still in Paris on Tuesday would he have had to backtrack and correct his own perception of the facts. But there is no obvious reason why even an interpreter who adopts the persistence hypothesis under discussion would make this additional assumption as well.

The second persistence hypothesis attributes to Bill, at the time on Tuesday when he received the information that Mary had left, the belief that Mary was in Paris on Sunday. This belief was not contradicted by the new information which reached him and so there was no cause for belief revision. It should be observed, however, that this hypothesis too isn't quite what justification of the prestate presupposition of *leave* requires either. This time the belief which it attributes to Bill just before he gets the new information is too weak – it is just the belief that Mary was in Paris on Sunday, not that she remained there until Monday. So once again Bill must accommodate. However, all that is required of him on this hypothesis is an addition to his beliefs, without the need to discard any he had.

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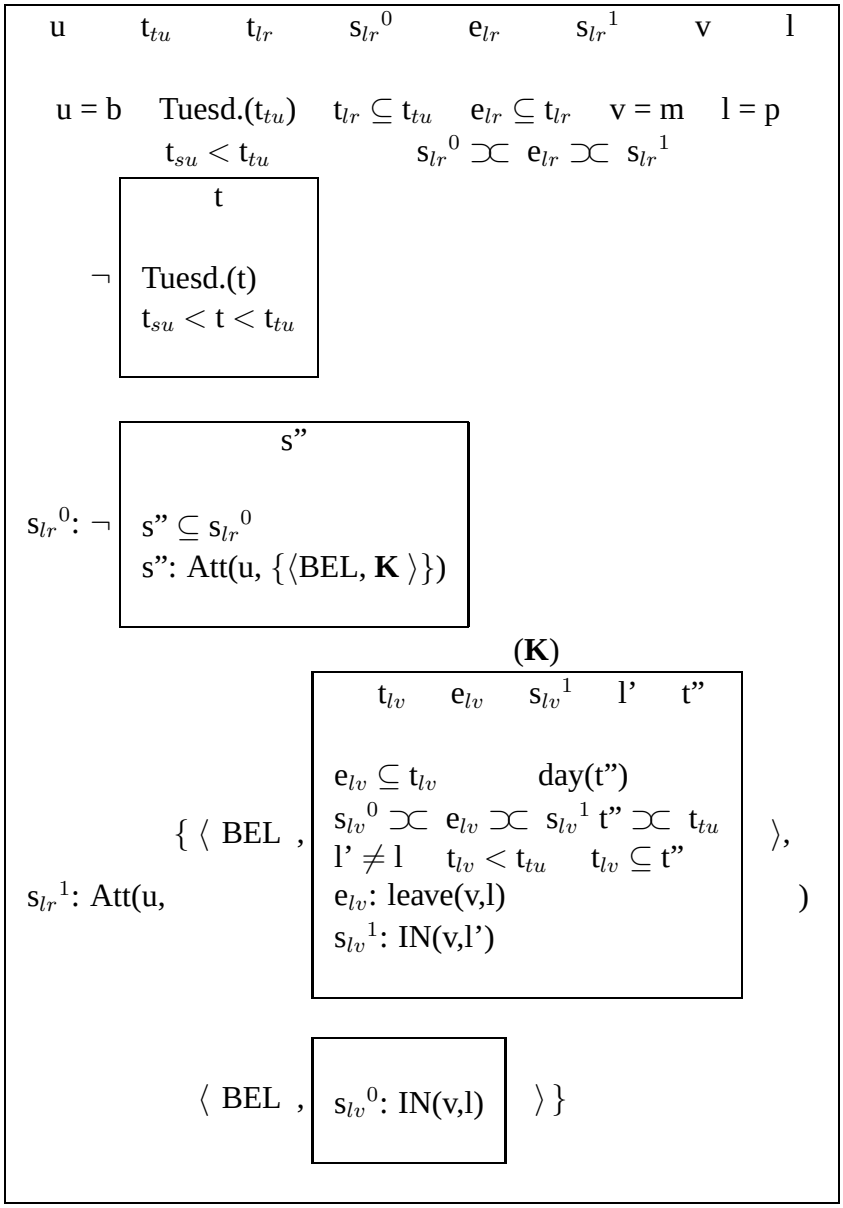
concerns the types of complex terms that should be allowed, and the operations that may appear in those terms. But whatever the details, it is clear that such a formalism would constitute a very substantial change from the one we are using. And so long as no decisions have been made about its exact properties, there isn't very much that we can say about its impact on semantics, or, for that matter, about its implications for the analysis of (1).

(16)



The differences in the interpretations which result from the two hypotheses are significant, but they are limited nonetheless. The interpretation processes that are guided by the two hypotheses converge in that they end up attributing to Bill the same final belief state (the one in which he is said to have been as the result of his second belief change on Tuesday). They differ only with regard to what they entail about his beliefs immediately before that. (16) represents what is common between the two interpretations of (1.b) – Bill's final belief state, together with the condition that up to the time when he received the new information he was not in that state.[27,28]

[27](16) is dependent on the representation (8) of (1.a) which serves as context for the justification of the presuppositions of (13). I have not repeated (8) here for reasons of space.

[28]Some may doubt whether prestate presuppositions are presuppositions at all. Or they may – a more moderate disagreement with the position I have assumed here – take it that they are conditions which function as normal entailments of positive declarative occurrences of the change-of-state verbs which trigger them and behave as presuppositions only when the trigger occurs within the scope of some operator, such as negation or a question. (For an early defence of a position similar to this see Wilson (1975).) Someone who holds this view of prestate conditions

In (16) the accommodated belief that Mary remained in Paris till she left on Monday has been integrated into the final belief state ascribed to Bill. **K**, the content representation of the belief specified in the first Att-condition of (16), is the same DRS which also represents the content of the belief that appears in the second Att-condition. The new conditions involving t_{tu} state that the time represented by t_{tu} is the Tuesday immediately following the Sunday represented by t_{su}.

It should be clear how (16) could be extended to a fuller representation of the interpretations that result from the two persistence hypotheses. In either case a further Att-condition would have to be added which describes the relevant part of Bill's attitudinal state just before he got the new information on Tuesday. As nothing of interest is revealed by these full representations, I see no point in displaying them.

4.7 Are the Persistence Assumptions really involved?

Do the persistence hypotheses involved in the two interpretations just described play in the interpretation of (1) the role that I have been attributing to them? There appear to be good reasons for doubting this. For one thing, isn't (16), which captures the common denominator of the two interpretations described in the last section, all that an interpretation of (1) should yield? And if (16) is all that interpretation of (1.b) should yield, could this representation not be obtained by simpler means? For instance, couldn't we simply assume that interpretation of (1) proceeds like this:

(17) (1.b) says that as a result of what Bill learned on Tuesday he adopted the belief that Mary left Paris on the preceding Monday. This entails the belief that she was in Paris at the point on Monday when she left (since leaving Paris on Monday evidently entails being in Paris at the time on Monday when one leaves, and so you cannot believe the first without believing the second.)

The problem with (17) is that it fails to do justice to the role that the first sentence of (1) plays in the interpretation of the second. And that isn't quite right. It is essential to the interpretation of (1) that the prestate of the event of Mary's leaving Paris which the second sentence speaks of is the same state that is spoken of in the first sentence – or, more precisely, that Bill must end up believing that they are one and the same state. This is something that the strategy described in the last section does capture, but (17) does not.

Persistence of the state of Mary being in Paris does play a role in the interpretation of (1). But as we will see presently, it almost certainly doesn't play the role that it was assumed to play in the account described in Section 4.6.

Let us, as a first step towards this, begin by considering the variant of (1) that is given in (18):

(18) On Sunday Bill heard that Mary was in Paris.
On Tuesday he learned that on the previous day she had visited the Swiss Embassy.

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might either want to maintain that the persistence hypotheses we are discussing are irrelevant to the interpretation of (1) or he would want to describe their role in different terms. I do not think however, that this issue matters. In particular I do not believe that it affects the question whether the hypotheses play any role at all in the interpretation of sentence sequences like (1) could be decided on the strength of the status which we ascribe to prestate conditions. More on this in the next section.

There is much that (18) and (1) have in common. The *that*-clause of the second sentence of (18) requires, just like the *that*-clause of the second sentence of (1), the context that is provided by the *that*-clause of the first sentence. And like in the case of (1) the context is not enough as it stands, but needs to be amplified by the assumption that the state of Mary's being in Paris persists till the relevant time on Monday. In the case of (18) this assumption is needed in particular to identify the intended referent of the NP *the Swiss Embassy*.[29]

So much for the similarities between (18) and (1). But there is also an important difference. In (18) the content of the second *that*-clause is *consistent* with the amplified context. (In fact, it is not just consistent with it, but entails it.) Because of this the final belief which (18) attributes to Bill is that on Monday Mary was still in Paris and that, while still in Paris, she went to the Swiss Embassy there.[30]

As a next step notice the similarity between the interpretation of (18) and that of the discourse (19), in which the contents of the *that*-clauses of (18) are presented as facts.[31]

(19) On Sunday Mary arrived in Paris. On Monday she visited the Swiss Embassy.

In (19) too the first sentence provides the context for the interpretation of the second sentence, and once again, in order that this context can deliver what the interpretation of the second sentence demands of it, it has to be amplified by a persistence assumption. For sequences of factual sentences like (19) the role of persistence in interpretation is well-known and has been closely studied. These studies have shown that it is a general property of narrative texts (i.e. texts which describe episodes that develop in time) that states which have been introduced at one point in the text should be understood as continuing to hold until the discourse gives notice that this is no longer the case. More fully, if the state s has been introduced by sentence S_n of the discourse and has been asserted by S_n to hold at t, and the sentences S_{n+1}, ... following S_n describe what is the case at times later than t, then s will be understood as still holding at these later times, unless and until it follows from one of these sentences that s has come to an end at or before one of those later times.[32]

The interpretation of (19) involves a straightforward application of this persistence principle. The state of Mary being in Paris that is introduced by S_1 as holding on Sunday is assumed to persist at and beyond the later time described by S_2 unless it follows from S_2 that the state has

[29]There are countless Swiss embassies across the globe, so the interpreter needs further information in order to determine which one all those embassies this occurrence of *the Swiss Embassy* refers to. One kind of information that will serve this purpose is information about where the given embassy is located. And that is precisely the information that emerges when persistence is applied to the context condition that is provided by the *that*-clause of the first sentence: If Mary was still in Paris on Monday, then it was the Swiss Embassy in Paris which she visited.

[30]So even if we were to assume that Bill's belief about Mary being currently in Paris persists till Tuesday, the new information described in (18) would not require him to revise that belief.

[31]I have changed the *was* of the *that*-complement of the first sentence of (18) – *(that) Mary was in Paris* – into *arrived*. The discourse *On Sunday Mary was in Paris. On Monday she visited the Louvre.* is strange because we are inclined to perceive an opposition between *Sunday* in the first sentence and *Monday* in the second – as if Mary was no longer in Paris when she went to the Louvre. This is a rhetorical effect which has nothing to do with what we are after and which we do not get in (1) or (18), where *Sunday* modifies the matrix verb and not the verb of the *that*-clause, The first sentence of (19) matches that of (1) and (18) in this respect, because it too carries no implications about the duration of Mary's stay in Paris.

[32]In the discourse literature this persistence property of narrative discourse is also known as *monotonicity*. Analyses of monotonicity and formulations of the "monotonicity principles" which are responsible for this kind of persistence can be found for instance in Caenepeel & Sandstrom (1993) and Reyle & Roßdeutscher (2001).

terminated before or during that time. Since visiting the Swiss Embassy in Paris is compatible with this state, the prediction is that the state still holds at and continues to hold beyond the time of this visit on Monday.

The third point to note is that just as (19) is a close factual counterpart to (18), (20) is a close factual counterpart to (1):

(20) On Sunday Mary arrived in Paris. On Monday she left.

Here too the persistence principle makes the right prediction: The state of Mary being in Paris is assumed to persist until the time at which the discourse indicates its termination. In the present case this means persistence at least until the time of the event which the second sentence describes. This assumption makes it possible to interpret the second sentence as describing an event of Mary leaving Paris. But in this case the event description entails that the state ends there. So the interpretation of (20) which results is that the state of Mary being in Paris, which starts at some time on Sunday, continues until some time on Monday, when it is terminated by the event of her leaving Paris.

The parallels between the interpretations of (18) and (1) on the one hand and those of (19) and (20) on the other are striking – so striking that it is almost inescapable to see them as involving the same principles. In particular, interpretation of the belief attributing discourses seems to make use of the same persistence principle as interpretation of the factual discourses, the only difference being that in the case of (19) and (20) persistence is applied to a primary context while in (18) and (1) it is applied to a secondary context. What this suggests is a theory of interpretation in which the complement clauses of attitude attributions can be treated as if they combine to form bits of narrative discourse – more precisely: which allows sequences of such embedded clauses to be incrementally interpreted according to the same principles which existing theories of discourse semantics assume for bits of narrative discourse consisting of non-embedded sentences.

I will not attempt to formulate such a theory here, but only make a few informal observations about its implications for the interpretation of discourses like (18) and (1).[33] The first implication is this: When interpreting a sequence of attitude reports like those in (1) and (18), the interpreter builds, as he goes along, not only a primary discourse context, but also a secondary one. Both contexts grow as discourse interpretation progresses and are updated according to the same principles of language interpretation, and these principles include principles of persistence or monotonicity: Both types of context come with a default assumption that stative conditions which are initially said to hold at certain times persist until there is clear evidence to the contrary.[34]

But of course, even if primary and secondary contexts come about in much the same way, their roles are very different. Primary contexts are what they have been made out to be ever since Stalnaker laid the foundations of dynamic interpretation: They capture the content of what has been interpreted already and provide the context for the utterances that follow. The role of a

[33] I believe that formalisation should not be all that difficult. At least this should be so at least for a restricted version, in which there is besides the primary context just one secondary context. In general the context structure can be much more complex, with different secondary contexts for different agents and/or different times. Even within a 'secondary' context which corresponds to a given agent's attitudinal state at a given time there may be a further hierarchical structure of 'subcontexts', e.g. reflecting the different modes of the attitudes of which it is composed. (Recall the remarks about complex attitudinal states in Section 3.1.)

[34] As far as this is concerned, the present approach seems to be much in the spirit of what Stalnaker must have had in mind when he introduced the concept 'secondary context' and coined this term for it.

secondary context is different. What that role is depends, first and foremost, on the status of the sentence or clause that has been responsible for its latest update. For instance, when the clause is the *that*-clause of an attitude attribution, the updated context will serve to characterise the content of the attributed attitude; and if it is the *that*-clause of an attribution of belief change, as in the examples we have been looking at, then the updated context typically serves as specification of the content of the belief which results from the attributed change.

In this theory persistence has regained its place in the interpretation of discourses like (1) which (17) denies it. Superficially this might look like a revindication of the interpretation strategy described in Section 4.6, but even a cursory reflection suffices to see that it really is nothing of the kind. In the new theory persistence is made to play a very different part from the one it was made to play in 4.6. The persistence assumptions that are postulated by the present proposal are *not* assumptions about the persistence of the subject's beliefs. Their status is a more abstract one. They are just what we have described them to be: interpretation principles which are operative not only at the level of primary but also of secondary contexts. Precisely what that amounts to can be assessed only in the light of the role which the secondary context ultimately comes to play in the interpretation of the given discourse. But whatever that may tell us about the persistence principles that are used in the updating of various secondary contexts, it is clear that the applications of these principles to the interpretation of (1) or (18) have nothing directly to do with the beliefs which the subject Bill may have entertained during the time between his first belief change on Sunday and his second one on Tuesday. From this point of view the present theory is anything but a reaffirmation of the strategy of Section 4.6.

For some readers it may have been plain from the start that the theory we have just outlined gives the better reconstruction of how people process and understand a discourse like (1). But for someone who approaches the problem presented by (1) from the perspective from which I – for better or worse – came to this problem, the point of view we have now reached is not self-evident. Let me, to conclude this section, briefly recapitulate this perspective and what it implies for the interpretation of a discourse like (1).

In a few words, the perspective was this: To correctly interpret the content of an attitude attribution, the interpreter often needs antecedent information about the attitudinal state of the attributee. When the given attribution is one of a sequence, then this information can usually be obtained, in part or in whole, from the attributions which precede it. Therefore the interpreter must, as he proceeds with his interpretation of the successive sentences of the sequence, build a representation of the attitudinal state of the attributee (or attributees) in question, and use, each time he tackles a new attribution, the representation of the attributee's attitudinal state that he has already obtained to make sense of what it is this new attribution contributes.

From this perspective it seems a natural assumption that in a case like (1), where the new sentence attributes an attitude at a later time than the state of which the interpreter has already obtained a representation, the interpreter should try to infer, on the basis of what he knows about the attributee at the earlier time, what his state should be like at the later time that is concerned in the new attribution. But natural though this extrapolation from the case of several attributions at a single time to different attributions at different times may seem at first sight, it doesn't seem – this is the central moral of this paper – to be what is actually going on. The persistence involved in the interpretation of such attribution sequences is *not* the persistence of any attitudes on the part of the attributee.

This is not to deny that persistence plays no part in the mental life of the attributees which such sequences describe. Surely, if they are at all like you and me, persistence will be as much

a part of how their mental states evolve as it is of ours. But whatever assumptions we, as interpreters, may be inclined to make about the persistence of the attitudes that are attributed to them by the sentences of which we are the recipients, it appears that these assumptions are not part of the interpretation process as such. Or at any rate, if they are part of the process at all, they do not seem to be part of it in the manner suggested in Section 4.6.

5 Summary and Conclusions

This paper has focused on the analysis of one example – a brief and fairly simple discourse, consisting of two attitude attributions to a single subject. Like other examples which have been discussed in the literature the two attributions are understood as related to each other in content. The example differs from those other examples in that (i) its attributions are not attributions of attitudes as such, but of attitudinal changes; and (ii) these changes are asserted to have taken place at different times. Because the attitude change attributed by the second sentence occurs some time after the change described by the first sentence, a complication arises for the use that can be made of the first sentence as context for the interpretation of the second. This complication has been the paper's central focus.

In my attempt to deal with this problem I have outlined two interpretation strategies. The first of these is based on the idea that interpretation of a sentence which claims that a subject was in a certain attitudinal state at a certain time t, or undergoes a change of attitudinal state at t often requires antecedent information about the subject's state at or just before t; so, when the antecedent discourse only provides information about the subject's attitudes at other times, then it will be necessary to extrapolate from that information to the subject's attitudes at the time to which the new attribution pertains.

The main conclusion of this paper is that plausible as this idea may seem initially, it is almost certainly not correct for discourses like (1). Rather, in successions of attitude attributions the clauses which describe the contents of the attributed attitudes form a kind of subtext, whose dynamic interpretation is subject to the same rules that govern dynamic interpretation of discourse in which no attitude attributions are involved. The difference between this second perspective and the first one doesn't manifest itself when all attributions speak of the subject's attitudinal state at a single time. It becomes visible only when the attributions concern different times (or, but that is a theme for another paper, different agents). It is this which makes sentence sequences of the type of (1) a genuine challenge for the semantics of attitude attribution.

The account of the interpretation of (1) which emerged from this study as the more likely one is still awaiting formalisation. I don't expect that a formalisation would encounter serious obstacles, but we won't be sure until the work has actually been done. Since the work hasn't been done yet, the last part of the story this paper has told had to be kept at an informal level. And because of the informal character of this last part, the much more formal presentation of the earlier parts may in retrospect look like a luxury one could well have done without. But this impression is widely justified at best. For without the attention that we have paid to formal detail in these earlier sections, the issue with which we have grappled in the final section wouldn't even have come into proper view.

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