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Craige Roberts & Judith Tonhauser (co-organizers)

Gregory Kierstead (editor)

The Ohio State University
# TABLE OF CONTENTS

Amaral, Patrícia, Cummins, Chris, & Katsos, Napoleon

“Experimental Evidence on the Distinction Between Foregrounded and Backgrounded Meaning” 1

Ebert, Christian

“Presuppositions and Information Structure as Incremental Interpretation Instructions” 8

Grubic, Mira

“One the Projection Behaviour of Freely Associating $mod$: (only) in Bole (West Chadic)” 23

Hirschberg, Tim

“Embedded Speech Acts are Scopeless” 38

Jayez, Jacquez

“Projection and Probability” 53

Lassiter, Dan

“Presuppositions, Provisos, and Probability” 67

Liu, Mingya

“How Evaluative Adverbs Project and Why” 82

Mayol, Laia & Castroviejo, Elena

“Projective Meaning and Implicature Cancellation” 97

Odon, Amaia

“Generalizations Entailed by the Global Context” 107

Paducheva, Elena

“Presuppositions: Familiarity Condition and Projection Tests” 121

Renans, Agata

“Projective Meaning of Only- Evidence from Polish” 129

Rubinstein, Aynat

“Projective Signals of Weak Necessity Modals” 141

Smith, E. Allyn & Hall, Kathleen

“Projection Diversity: Experimental Evidence” 156

Xue, Jingyang & Onea, Edgar

“Correlation Between Presupposition Projection and At-issueness: An Empirical Study” 171
WORKSHOP PROGRAM

Monday, August 8, 2011
5-5:30pm: Introduction: Craige Roberts (Ohio State University) and Judith Tonhauser (Ohio State University)
5:30-6:30pm: Poster session
Christian Ebert (University of Tuebingen) “Presuppositions and Information Structure as Incremental Interpretation Instructions”
Tim Hirschberg (Goethe-University Frankfurt) “Embedded Speech-Acts are Scopeless”
Dan Lassiter (NYU Linguistics and Institute of Philosophy, University of London) “Presupposition, Provisos and Probability”
Mingya Liu (University of Goettingen) “How Evaluative Adverbs Project and Why”
Laia Mayol (Universitat Pompeu Fabra) & Elena Castroviejo (Spanish National Research Council (CSIC)) “Projective meaning and implicature cancellation”
Amaia Garcia Odon (Universitat Pompeu Fabra) “Accommodating generalizations”
Elena Paducheva (Academy of Sciences of Russia, Moscow) “Presuppositions: Familiarity conditions and projection tests”
Agata Renans (University of Potsdam) “Projective Meaning of Only - Evidence from Polish”
Sonja Tiemann (University of Tuebingen) “Pressuposition accommodation – a psycholinguistic perspective”

Tuesday, August 9, 2011
5-5:30pm: Elizabeth Allyn Smith (Northwestern) & Kathleen Currie Hall (City University of New York) “Projection Diversity: Experimental Evidence”
5:30-6pm: Patricia Amaral (University of Liverpool), Chris Cummins (University of Cambridge) & Napoleon Katsos (University of Cambridge) “Experimental evidence on the distinction between foregrounded and backgrounded meaning”
6-6:30pm: Edgar Onea (University of Goettingen) & Jingyang Xue (University of Goettingen) “Correlation between projective meaning and at-issueness: An empirical study”

Wednesday, August 10, 2011
5-5:45pm: Elizabeth Allyn Smith (Northwestern) & Carl Pollard (Ohio State University) “An Alternative Explanation for Presupposition Projection Variability”
5:45-6:30pm: Jacques Jayez (ENS de Lyon and L2C2, CNRS) “Projection and probability”
Thursday, August 11, 2011
5-5:45pm: Mira Grubic (University of Potsdam) “On the projection behaviour of freely associating mod- (= only) in Bole”
5:45-6:30pm: Dorit Abusch (Cornell) “Sorting out Closure and Enrichment in Comics and Narrative”

Friday, August 12, 2011
5-5:45pm: Aynat Rubinstein (University of Massachusetts, Amherst) “Projective signals of weak necessity modals”
5:45-6:30pm: Discussion
Experimental evidence on the distinction between foregrounded and backgrounded meaning

Patrícia Amaral (University of Liverpool)
Chris Cummins (University of Cambridge)
Napoleon Katsos (University of Cambridge)

1. Introduction

The precise nature of the distinction between asserted/foregrounded meaning and non-asserted/backgrounded meaning (e.g. presuppositions) is crucial to investigations of what types of meanings can project. We adopt the view that this distinction relies on discourse structure: backgrounded information does not contribute to updating the conversational record (Lewis 1979), whereas foregrounded information does (it addresses the ‘Question Under Discussion’, cf. Roberts 1996; Roberts, Simons, Beaver & Tonhauser 2009). As a consequence, foregrounded information may be challenged or refuted by conversational participants, whereas backgrounded information is harder to refute. This paper investigates the psychological validity of the distinction between these two types of meaning. Is this distinction relevant for native speakers as they use and comprehend language? And is information backgrounding a categorical or a gradient phenomenon? Results of rating and response-time data from a pilot study show that native speakers are sensitive to the difference between these types of information. Our results also provide evidence for an approach to backgrounded content as a heterogeneous phenomenon, corresponding to gradient felicity judgments from native speakers.

This paper is structured as follows. In Section 2, we discuss the theoretical distinction between foregrounded and backgrounded meaning and justify the types of backgrounded meaning that we will focus on in our study. In Section 3, we present the methodology of our experiment. In Sections 4 and 5, we present and discuss the results of the study. Section 6 provides concluding remarks.

2. The distinction between foregrounded and backgrounded meaning

When people communicate, they implicitly assume a partition in the information they share: whereas some information is explicitly introduced in the discourse, and may be accepted or rejected by the participants in the conversation, another portion of information is not explicitly discussed, agreed upon or questioned. This portion of information is ‘taken for granted’. Without this partition, conversation would be unnecessarily explicit, overloaded, and probably an unmanageable task. Natural languages provide different types of devices that encode this partition, both lexical (i.e. lexical items like only, stop, manage) and non-lexical (e.g. syntactic devices like cleft constructions).
We adopt the view that asserted or foregrounded meaning\(^1\) contributes to context update (Lewis 1979, Stalnaker 1976) in that it addresses the Question Under Discussion (QUD) in the sense of Roberts (1996). The contribution of non-asserted or backgrounded meaning for the conversation has been analyzed in different ways, to a great extent due to the heterogeneity of this type of content. However, little is known about the psychological validity of this distinction for native speakers. Are native speakers sensitive to this partition between types of content in the structure of discourse? In particular, how easily do they accept the refutation of backgrounded content?

In this paper, we focus on backgrounded implications that have been treated as presuppositions. There have been several attempts in the literature to distinguish among categories of presupposition triggers, on the basis of different criteria. Abusch (2010) proposes a distinction between “hard” and “soft” presupposition triggers on the basis of their defeasibility properties. For Kadmon (2001), presupposition triggers form a continuum on the basis of their projection behavior (cancelability and context dependence). Although these criteria have played a major role in the study of presupposition, in this paper we follow the proposal by Zeevat (1992) in considering two types of presupposition triggers. A first group of triggers instantiates the anaphoric nature of presupposition, as they involve the retrieval of an entity or eventuality previously mentioned in the discourse: these triggers are “…anaphoric in the sense that their primary function is—like anaphora—to collect entities from the environment in order to say new things about them” (Zeevat 1992: 397). Since these triggers show an analogy with anaphora resolution, they are called *resolution triggers*. A second group is that of *lexical triggers*, lexical items like nouns and verbs that encode certain “preconditions” of their main content: “The conditions that must be met are the lexical presuppositions of the concept. Their function is therefore very different, even though they may refer to pre-established knowledge and often do so” (Zeevat 1992: 397). As is clear in this definition, Zeevat’s classification of presupposition triggers assumes a relation between asserted and non-asserted content. We are interested in this relation in trying to assess native speakers’ sensitivity to the difference between these two types of content.

We selected five triggers, on the basis of semantic and syntactic criteria: a resolution trigger, the lexical item *again*\(^2\), and lexical triggers whose presuppositions can be seen as “preconditions of actions and states” (Zeevat 1992: 397), *stop* and *continue*. We also considered triggers of implications with debatable status (i.e., presupposition or entailment), specifically only (cf. Horn 1969, 1996; Roberts, to appear), and

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\(^1\) ‘Asserted’ and ‘foregrounded’ meaning are not necessarily equivalent expressions. For example, a presupposition (i.e. a non-asserted implication) can be used to convey new information and hence be foregrounded, as in the example *Peter found out that Mary is pregnant* uttered to inform a third party that Mary is pregnant. For the current purposes of this paper, we will assume that the two expressions are equivalent.

\(^2\) Zeevat includes *again* in a third group of presupposition triggers that also contains *too*, *also* and *another*. These triggers play a role in the “bookkeeping involved in storing information by humans” (Zeevat 1992:399). However, since the presupposition of *again* pertains to the identification of a propositional antecedent in the context, and hence conforms to the definition of resolution triggers, we will consider it as an anaphoric trigger of the type previously introduced.
a non-lexical trigger, the comparative construction, as in *Barbara is a better linguist than Jane* (ps: Jane is a linguist).

3. Methodology

Subjects were presented with question-answer (Q-A) pairs in which a negative answer is provided to the question, in two conditions: (i) the continuation of the answer addresses the foregrounded content of the question (“Foreground”), and (ii) the continuation of the answer addresses the backgrounded content of the question (“Background”). This is exemplified in (1)-(2) below for the presupposition trigger *stop*:

(1) Q: Did Julia stop smoking?  
   A: No, she smokes. [Foreground condition]  
(2) Q: Did Julia stop smoking?  
   A: No, she didn’t use to smoke. [Background condition]

For each item, subjects were asked to rate “how natural” the answer was, on a scale of 1-5. Two Q-A pairs were administered to each subject for each condition. Two versions of the experiment were constructed, such that the items presented in the Foreground condition in version 1 were presented in the Background condition in version 2, and vice versa. The experiment was implemented in E-Prime and response latencies were also measured. Participants (n=30) were native English speakers, recruited from the student body of the University of Cambridge. They were allocated randomly to either version 1 or version 2 of the experiment.

Our predictions are as follows. If native speakers are sensitive to the distinction between foregrounded and backgrounded information in discourse, Q-A pairs in the Background condition (as in (2)) should be perceived as infelicitous. Hence, we predict that the answers in the Background condition should systematically receive lower ratings than the items in the Foreground condition. Moreover, if information in the background is harder to retrieve than information in the foreground, then refuting information in the background ought to give rise to a slowdown in response time.

4. Results

Results for the triggers *continue*, *stop* and *only* are as follows.

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Mean rating (SD)</th>
<th>Mean response time, ms (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreground</td>
<td>Background</td>
</tr>
<tr>
<td>continue</td>
<td>3.97 (1.16)</td>
<td>2.38 (1.19)</td>
</tr>
<tr>
<td>stop</td>
<td>3.42 (1.15)</td>
<td>2.45 (1.16)</td>
</tr>
<tr>
<td>only</td>
<td>4.48 (0.93)</td>
<td>3.08 (1.31)</td>
</tr>
</tbody>
</table>
As the materials with *again* and the comparative gave rise to unintended ambiguities in one test condition in this pilot study, we are unable to report counterbalanced results for these triggers. The following results are based upon each participant’s rating of two items for each trigger, both with either foreground continuations (for 15 participants) or background continuations (for the other 15).

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Mean rating (SD)</th>
<th>Mean response time, ms (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreground</td>
<td>Background</td>
</tr>
<tr>
<td>again</td>
<td>4.13 (0.97)</td>
<td>2.87 (1.11)</td>
</tr>
<tr>
<td>&lt;comparative&gt;</td>
<td>4.37 (1.00)</td>
<td>2.60 (0.77)</td>
</tr>
</tbody>
</table>

These preliminary results show that, as predicted, refutations in foreground conditions are preferred to those in background conditions for each type of presupposition trigger. Paired t-tests applied to the counterbalanced conditions reveal a highly significant preference in judgements for foreground rather than background conditions (all p < 0.001). *Post hoc* comparisons show a significant preference in the background condition for *only* versus *stop* (t = 3.46, p < 0.001 two-tailed) and *only* versus *continue* (t = 3.08, p < 0.01 two-tailed). In the foreground condition, these preferences are also significant, as is the preference for *continue* versus *stop* which does not approach significance in the background condition (*only* versus *stop*, t = 5.48, p < 0.001 two-tailed; *only* versus *continue*, t = 2.77, p < 0.01 two-tailed; *continue* versus *stop*, t = 2.70, p < 0.01 two-tailed). Each of these comparisons remains significant at p < 0.05 with a Bonferroni correction.

Similar planned comparisons using paired t-tests for response times also show a preference for foreground conditions over background (*continue*, t = 1.68, p < 0.05; *stop*, t = 2.40, p < 0.01; *only*, t = 3.55, p < 0.001; all one-tailed).

5. Discussion

The results demonstrate that native speakers are sensitive to the distinction between foregrounded and backgrounded information. Overall, conditions in which backgrounded information was refuted were perceived as less felicitous than those in which foregrounded information was refuted, as shown by acceptability ratings. Foreground conditions also yield significantly faster response times for the counterbalanced test items, suggesting that retrieving backgrounded information (i.e. information which is not being actively used to update the conversational record) requires extra processing time.

There is also considerable variability between triggers as to the acceptability of refuting backgrounded content. Our results suggest that this is significantly easier in the case of *only* than *continue* or *stop*, with *again* and the comparative construction yielding numerically intermediate acceptability ratings. As discussed above, the status of the prejacent of *only* (e.g. the proposition *John went to the library* in the sentence *Only John went to the library*) is a theoretically-contested issue, which motivated its inclusion in
this study. The acceptability ratings of only in the background condition could be interpreted as providing support for the view that the prejacent is an entailment of only (cf. Horn 1996 and Roberts, to appear).

More broadly, these results could be held to indicate that presupposition is a gradient phenomenon. If we consider Zeevat’s distinction introduced above, we can hypothesize that in the case of lexical triggers like stop and continue the refutability of backgrounded content is perceived as particularly troublesome to communication. For example, one cannot stop or continue a process that has never held. This should be reflected in native speakers’ judgements of the felicity of Q-A pairs like (2), repeated below.

(2) Q: Did Julia stop smoking?  
   A: No, she didn’t use to smoke.

Lexical triggers encode the “preconditions” for their asserted content: refuting these pre-conditions is not only pragmatically infelicitous but also undermines the truth of the asserted content. With other classes of triggers, the nature of the violation in the background condition is slightly different. The presuppositions of resolution triggers involve the identification of an entity (an individual or a proposition) that has been previously mentioned in the discourse. Although the ability to retrieve that entity from shared knowledge can be seen as a precondition to add new information about it, the truthfulness of the foregrounded content is not contingent upon the hearer’s ability to resolve the anaphoric element. So with respect to a question containing the presupposition trigger again as in (3), it may be true that Susan kissed Dave today and false (or unknown) that she has kissed him before.

(3) Q: Did Susan kiss Dave again today?  
   A: No, she never kissed Dave before.

Although the continuation of the answer in (3) corrects the presupposed implication that Susan kissed Dave before, and hence revises the assumptions taken to be shared by the conversational participants, the nature of this correction differs from the one described for lexical triggers.

The acceptability of correcting notionally ‘presupposed’ content may also depend upon the availability of certain additional reasoning steps. For instance, correcting the background content may be more felicitous when the entailments of this correction also suffice to negate the foreground content and thus answer the question under discussion. For example, in (4), one of the critical items used in this study, the negation of the presupposition that Mary watches soaps provides information that helps restrict the possible semantic values of the set of alternatives to the focused constituent of only, and hence partially resolves the question under discussion (What does Mary watch?). The acceptability of an answer achieved through such reasoning may come at an additional processing cost, as indexed by response latency.

(4) Q: Does Mary watch only soaps?
A: No, she doesn't watch soaps.

However, it is necessary to exercise caution in the interpretation of these preliminary data. We note that there are also significant differences in the acceptability ratings in the foreground conditions, with only once again preferred to continue and stop. This suggests that the high acceptability of only in the background case may to some extent reflect item effects. Given that continue is significantly more acceptable than stop in the foreground case, but that this does not hold in the background case, we consider it unlikely that item effects are wholly responsible for the pattern of acceptability in the background conditions. In follow-up work we aim to explore this issue further in an attempt to disentangle item effects from effects due to the putatively gradient nature of information backgrounding. While we intend to address this issue experimentally, we believe that the variability of our results may eventually shed light on something more essential to the understanding of the phenomenon of backgrounded meaning, namely the importance of lexical semantics. After a period during which studies of presupposition have mainly adopted structural (i.e. rule-based) approaches, as seen in most theories of projective behavior, there seems to be a recent tendency to explore lexical differences between triggers (this is paralleled by a more general tendency in other fields of linguistics to focus on the lexicon as the core of the native speaker’s linguistic knowledge). The challenge, then, is to reconcile the variability and partly idiosyncratic behavior of presupposition triggers with a theory of types of meaning that pattern in systematic ways.

Our results may also be considered against the background of processing studies. Foregrounding and backgrounding is a major area of psycholinguistic inquiry on text comprehension. These terms however are used in a wider sense than in linguistics, and they concern the effects of bringing some information in the focus of attention (in the text-comprehension sense of the term, i.e. information that addresses the main theme of the text). It is consistently reported that when information is in the focus, it is processed more deeply than when it is in the background (Sanford & Sturt, 2002; Sturt, et al. 2004; among others). To bring information into focus, existing studies manipulate discourse context and syntactic/semantic structure. For example, some propositional content in the main clause in one condition could be compared to the same propositional content in a relative clause in another condition. In this sense, the present study can be seen as a specialised case (or indeed, the ideal case) of the study of this phenomenon, as presuppositions seem to be the main and principled means by which natural languages encode the status of meaning as asserted/foregrounded or non-asserted/backgrounded.

6. Conclusion

In the pilot study reported in this paper we have addressed the psychological validity of the distinction between foregrounded and backgrounded meaning. We have focused on the acceptability of refuting backgrounded content (specifically, presuppositions) vis-à-vis foregrounded content in Q-A pairs. Our results of rating and response-time data suggest that native speakers are sensitive to the partition between
these two types of meaning in discourse. The results also point to the heterogeneity of the domain of backgrounded meaning.

These results may contribute for the project of establishing an experimentally supported typology of presuppositions, thus advancing our understanding of the psychological status of non-asserted content. In further work, we intend to pursue the bearing of experimental research on theoretical endeavours to distinguish between categories of projection triggers on the basis of the relation between the asserted and non-asserted components of their meaning.

References

Presuppositions and Information Structure  
as Incremental Interpretation Instructions  
Christian Ebert  
Department of Linguistics  
University of Tübingen  

Abstract  
As it is known since the first days of discussions on presuppositions, presuppositions and  
information structure interact in intricate ways (see eg. Strawson, 1964; Beaver, 2010, for an  
early and a more recent reference). I propose that the observed interplay of presuppositions  
and information structure is due to the fact that both serve the common purpose of guiding the  
hearer’s interpretation process. I will present a formalization of the above idea by devising a  
simple system that describes a hearer’s belief update during the process of utterance interpre-
tation, where presuppositions are treated as simple non-at-issue meanings.

1 Introduction  
To set the stage, I take it that the basic communicative move of a speaker is to establish a certain  
piece of information as the common ground between her and a hearer. In the formal semantics  
literature following the lead of (Stalnaker, 1978) this move is formalized as an update of a body  
of shared information, ie. the common ground. However, I claim that it is crucial for the under-
standing of presuppositions to view common ground update as a collaborative process between  
speaker and hearer in the spirit of Clark and Schaefer (1989): first, the hearer updates his private  
knowledge with the information conveyed by the speaker. Then, in a second step, the hearer  
reports on this update with some type of feedback. Only in case this feedback is positive can  
the speaker assume that the hearer successfully incorporated the information into his knowledge,  
thus making the information common ground.

I assume that a hearer interprets utterances by working incrementally through a sequence of  
instructions that tell him how to update his knowledge state. Another way to view this is to say  
that the hearer performs a series of interpretative acts, which is in line with the view of Kracht (2010)  
that inspired the present paper. The linguistic signal contains clues as to 1. what instructions the  
hearer is supposed to perform and 2. in which order they are to be performed. For instance, If John snores then Mary will be angry may be regarded to encode an instruction to assume that John snores and to accept that Mary will be angry in context of this assumption.

An additional function of these instructions is to delimit the material that the speaker considers  
to be under discussion, ie. the material on which the speaker expects feedback. In other words, the  
hearer is asked to indicate whether he was able to successfully follow the instruction. In the system  
to be explained below we will thus see information that occurs as argument of instructions and  
information that is processed ‘outside’ of instructions. While the former constitutes information  
that is at-issue, the latter is non-at-issue meaning that will be implemented to project across the  
former. The present proposal can thus be seen as an implementation of the idea put forth by  
Beaver et al. (2011), that it is exactly the non-at-issue meaning that is projective.
Crucially, presuppositions and information structure serve as indicators to deviate from the default and to process increments in an order possibly different from what the plain linguistic signal suggests. In addition, they also determine those pieces of information that are to be interpreted inside/outside of instructions, i.e. that are at-issue/non-at-issue. Let me give a rough informal outline of these ideas at hand of the following example from (Beaver, 2010, (73c,d)), which illustrates the interaction of presupposition and focus. Whereas (1b) comes with the expected factive presupposition triggered by \textit{discovers}, (1a) lacks this presupposition\footnote{I also cite here the suggestive focus markings from Beaver’s article, but obviously accent on \textit{plagiarized} would allow for further focus projection. Crucially, I assume that the F-marking found in the antecedent of (1a) targets the presupposed proposition, whatever material this marking may comprise.}.

\begin{enumerate}
\item a. If the T.A. discovers that your work is [plagiarized]$_F$, I will be [forced to notify the Déan]$_F$. \hfill\Rightarrow \noindent\text{no factive presupposition.}
\item b. If the T.A. [discovers]$_F$ that your work is plagiarized, I will be [forced to notify the Déan]$_F$. \hfill\Rightarrow \noindent\text{factive presupposition: your work is plagiarized.}
\end{enumerate}

In both cases, disregarding information structure for the moment, the sentence provides the hearer with two instructions: one of assuming that the T.A. discovers that his work is plagiarized and one of accepting that the speaker will be forced to notify the Dean in the context of the assumption. Crucially, the factive \textit{discovers} triggers the presupposition that it is true that the hearer’s work is plagiarized (marked schematically by $\partial$).

\begin{enumerate}
\item assume : the T.A. discovers that your work is plagiarized, $\partial$(your work is plagiarized)
\item accept : I will be forced to notify the Dean
\end{enumerate}

Now take (1b) first. If we take focus to indicate at-issue information by way of marking the propositional argument of instructions, and presuppositions to indicate non-at-issue information by way of marking propositions that are interpreted outside of instructions, then the first \texttt{assume} instruction is actually interpreted as:

\begin{enumerate}
\item your work is plagiarized ; assume : the T.A. discovers that your work is plagiarized
\end{enumerate}

In other words, the presupposition projects over the assumption instruction, as desired. Note that in this view focus and presuppositions work in opposing directions, specifying information that is interpreted inside/outside instructions, respectively. Matters are different with (1a). Here focus marking as well as presupposition marking target the proposition \textit{your work is plagiarized}. Since they both work in opposing directions it is reasonable to assume that they cancel each other out in this case. Therefore, the first \texttt{assume} instruction is actually interpreted as:

\begin{enumerate}
\item assume : the T.A. discovers that your work is plagiarized, your work is plagiarized
\end{enumerate}

In other words: the presupposition becomes a part of the assumption proper, which again is as desired.

In the following I will make these concepts more precise. First I will outline the basic system of instructions and their update effects on a hearer’s information state. This will all be propositional

\begin{enumerate}
\item a. If the T.A. discovers that your work is [plagiarized]$_F$, I will be [forced to notify the Déan]$_F$. \hfill\Rightarrow \noindent\text{no factive presupposition.}
\item b. If the T.A. [discovers]$_F$ that your work is plagiarized, I will be [forced to notify the Déan]$_F$. \hfill\Rightarrow \noindent\text{factive presupposition: your work is plagiarized.}
\end{enumerate}
and capable of deriving the basic projection behavior of presuppositions, as will be shown. I will then proceed to extend the update rules to deal with discourse referents and bring focus and topicality into the picture and discuss how some of the observed interactions of these categories with presupposition can be explained.

2 Instructions & Presuppositions

To start, I take it that the intuitions about instructions and what they do will become reasonably clear without a precise definition of their update effects on a hearer’s information state. I will therefore postpone these definitions until later and first think about the available instructions and their correspondence to sentences of natural language. To this end let us start out with three basal instructions/interpretative acts, namely one of accepting information (accept), one of assuming information (assume) and one of rejecting information (reject). An accept(\(\varphi\)) instruction instructs the hearer to accept information \(\varphi\), i.e. to add it to his current information state. An instruction assume(\(\varphi\)) tells the hearer to assume \(\varphi\). Finally, reject(\(\varphi\)) instructs the hearer to discard the information that \(\varphi\).

These instructions are then what is processed by the hearer to update his information state. For instance, a compound sentence \(S\) and \(S'\) would come down to two sequenced instructions accept(\(S\)); accept(\(S'\)) (where ; is used to indicate consecutive performance of instructions). A conditional If \(S\) then \(S'\) would give rise to a sequence like assume(\(S\)); accept(\(S'\)). And sentential negation as in It’s not the case that \(S\) would ask the hearer to perform reject(\(S\)).

As indicated, the linguistic signal contains cues as to how to set up the sequence of interpretation instructions. However, since we want these sequences of instructions to be processable strictly incrementally from left to right, we cannot allow for any structure within such sequences that run counter to incrementality. To illustrate the problem, we want the sentences [If \(S\) then \(S'\) and \(S''\)] and If \(S\) then [\(S'\) and \(S''\)] (disambiguated by indication of some minimalistic syntactic structure) to result in interpretations that intuitively correspond to (the result of processing) the sequences in (5a) and (5b), respectively.

\[(5)\] a. [assume(\(S\)); accept(\(S'\)); accept(\(S''\))] b. assume(\(S\)); [accept(\(S'\)); accept(\(S''\))]

Unfortunately, processing of (5b) would force us to process the result of the sequence accept(\(S'\)); accept(\(S''\)) prior to somehow conjoining it to the assumption instruction for \(S\), which is not in the spirit of the incremental processing that we have in mind. The conclusion is that we cannot allow for free bracketing within instruction sequences and that we have to mark scope boundaries that are needed for disambiguation as in the case above by other means\(^2\).

In the proposed system, I use auxiliary control instructions to control the update, which are used to manage hypothetical reasoning after assumptions. The first auxiliary instruction \(\Rightarrow\) can be regarded a translation of then in if-then conditionals. It instructs the hearer to change from a state of hypothesizing (induced by an assume instruction) to a state of reasoning using the hypotheses

\(^2\)This point is obviously pertinent to all approaches to incremental semantics in some way or other (see eg. Vermeulen, 1994)
accepted so far. Second, the control instruction □ signals the end of hypothetical reasoning. To illustrate, a conditional construction If S then S’ would correspond to the sequence of instructions

\[ \text{assume}(S); \triangleright; \text{accept}(S'); \square \]

The troublesome bracketing mentioned above can now be avoided such that the sequences in (5) come out as follows.

(6) a. \text{assume}(S); \triangleright; \text{accept}(S'); \square; \text{accept}(S'') \\
    b. \text{assume}(S); \triangleright; \text{accept}(S'); \text{accept}(S''); \square

A proper interpretation now obviously hinges on the exact definition of these control instructions, to which I will come later.

The actual system I like to propose is reductionistic in that I decompose two basal instructions even further. Instead of taking the assumption assume as a solitary instruction, I decompose it into a step of hypothesizing (hyp) and acceptance. I take the hyp instruction to tell the hearer to enter a state of hypothetical reasoning, ie. to be aware that the following instructions are understood to be hypothesis in further processing. Therefore, I want the sequence of instructions hyp; accept(\varphi) essentially to come down to an instruction assume(\varphi) to assume \varphi. In other words, I take assume simply as an abbreviation for the sequence of hyp and accept as follows:

(7) \text{assume}(S) := \text{hyp}; \text{accept}(S)

In a next step I will get rid of a separate rejection instruction reject by introducing a third auxiliary instruction \perp that instructs the hearer to clear his present information state, ie. to forget what he knows. While this instruction does not make much sense as a stand-alone instruction, it does make sense in a state of hypothetical reasoning to forget the currently active hypotheses. In fact, I will use \perp exactly in this way to treat also reject as an abbreviation in the following way\(^3\):  

(8) \text{reject}(S) := \text{assume}(S); \triangleright; \perp; \square \quad (\text{= hyp; accept}(S); \triangleright; \perp; \square \text{ by (7)})

With these considerations we have now arrived at the final sets of instructions.

**Definition 1**

The set of basal instructions is \{hyp, accept(\cdot)\} and the set of auxiliary instructions is \{\triangleright, \square, \perp\}.

As indicated above, truth-functional expressions such as and or if-then specify how instructions are to be broken down into sequences of instructions. We are now able to specify the precise translation rules.

**Definition 2 (Translation)**

The translation of a parsed natural language sentence into a sequence of instructions is guided by the following rules (where assume(S) and reject(S) are understood as the abbreviations in (7) and (8), respectively):

- (T1) accept(\neg S) \simrel \text{reject}(S)
- (T2) accept(S and S') \simrel accept(S); accept(S')
- (T3) accept(if S then S') \simrel assume(S); \triangleright; accept(S'); \square
- (T4) accept(S or S') \simrel hyp; reject(S); \triangleright; accept(S'); \square

\(^3\)This is essentially exploiting the equivalence \neg \varphi \equiv \varphi \rightarrow \perp
The translations are straightforward. To accept a negated sentence means to reject it (T1). To accept two sentences conjoined by *and* means to accept the first and subsequently accept the second (T2). Accepting a conditional means to assume the protasis and then to accept the apodosis within this assumption (T3). The translation for *or* in (T4) exploits the logical equivalence $\varphi \lor \psi \equiv \neg \varphi \rightarrow \psi$: hypothetically reject the first disjunct, and if that succeeds, accept the second disjunct.4

To give a simple example, an utterance of the sentence

\[(9) \text{ If John stops smoking and Peter doesn’t drink, Mary is happy.}\]

will be understood as an instruction to accept its propositional content. By application of the translation rules this comes down to processing the sequence of instructions at the bottom of the following table.5

4In fact, all truth-functional connectives can be reduced to $\rightarrow$ in this system, which becomes even more obvious when the abbreviations for *assume* and *reject* are played out.

5In the following I state matters as if instructions were applied to the surface form of an NL expression, mainly to keep things perspicuous. It should be remembered, however, that I take the actual input to be parsed, i.e. structurally annotated (and hence disambiguated), for instance as

\[\text{IF [John stop smoking AND [NOT Peter drink]] THEN [Mary is happy].}\]

in the example above.
**Definition 3 (Sequencing)**

\[
\begin{align*}
\text{(S1)} & \quad \text{accept}(\Gamma, \partial \psi, \Gamma') \rightsquigarrow \psi; \text{accept}(\Gamma, \Gamma') \\
\text{(S2)} & \quad X; \psi \rightsquigarrow \psi; X \quad (X \text{ some basal instruction})
\end{align*}
\]

While rule (S1) classifies presupposed information as non-at-issue by removing it from an instruction it occurs in, (S2) implements the independence of non-at-issue material from at-issue material and forces non-at-issue material to be interpreted before at-issue material. In other words, (S2) causes non-at-issue material to project.

Applying the sequencing rules to (10) yields the following final instruction sequence:

\[
\begin{align*}
\text{(11)} & \quad \text{smoke; hyp; accept(stop); hyp; accept(drink); ⊥; □; } \triangleright; \text{ accept(happy); □}
\end{align*}
\]

Note that in this notation, non-at-issue information like smoke is simply written onto the instruction sequence, which looks slightly inconsistent. This is merely a notational convention that serves to set if apart from information occurring in basal instructions and save some space. But in fact, it is understood as another instruction to the hearer to update his information state with that information. In this respect, non-at-issue information \( \varphi \) is taken to effect the hearer’s information state in exactly the same way as at-issue information coming in form of an accept(\( \varphi \)) instruction.

To become more precise on the update let us model the hearer’s information state as a set of possible worlds.

**Definition 4 (Information State – Propositional Version)**

An information state \( i \) is a set of worlds \( i \subseteq W \).

The basic update of the hearer’s information state with some propositional information \( \varphi \) is then straightforwardly defined as a standard eliminative update. Likewise, support and consistency of a proposition by/with an information state is defined straightforwardly.

**Definition 5 (Basic Update & Support)**

Let \( i \) be an information state. The basic update \( i \oplus \varphi \) of an information state \( i \) with \( \varphi \) is defined as

\[
\begin{align*}
\text{(12)} & \quad i \oplus \varphi := i \cap \llbracket \varphi \rrbracket \\
& \quad i \text{ supports a proposition } \varphi \text{ iff } i \oplus \varphi = i \\
& \quad \varphi \text{ is consistent with } i \text{ iff } i \oplus \varphi \neq \emptyset
\end{align*}
\]

Let us come back to the issue of non-at-issue vs. at-issue information by exercising the simple example in (13a). After translation and sequencing, the resulting instruction sequence in (13b) consists of the (non-at-issue) instruction to to update the information state with smoke and the (at-issue) instruction accept stop subsequently.

1. **John stopped smoking.**
2. smoke; accept(stop)
Processing the first instruction, the hearer will learn that John smoked.

\[ i' = i \oplus [\text{smoke}] = i \cap [\text{smoke}] \]

Processing the second instruction, he will learn that John stopped it.

\[ i' \oplus [\text{stop}] = i \cap [\text{smoke}] \cap [\text{stop}] \]

So where’s the difference?

As pointed out above, the difference is precisely in the feedback requirements of the hearer: the hearer is required to give feedback only on the accept instruction. To illustrate what this comes down to, consider smoke first and assume that it is consistent with the hearer’s information state \( i \), ie. that the hearer does not have any information contradicting the fact that John smokes. In this case the update with smoke will proceed happily and since no feedback is required on this update, that is it. This is different with the subsequent accept(stop) instruction. If stop is consistent with \( i \), this update will also cause no problems, but this time the hearer is asked to signal this. In other words, he will have to give positive feedback. If on the other hand stop is not consistent with \( i \), this update cannot proceed, which in turn will elicit negative feedback from the hearer.

Now consider the case that the non-at-issue information smoke is not consistent with \( i \) and that hence the update of \( i \) fails. Then processing the sequence will stop at this point and, in particular, the subsequent accept(stop) instruction will not be performed. In other words, the hearer will not even come to assess the truth of stop. This will usually also elicit some type of feedback, but one of a different quality, namely one signalling that the instruction sequence could not be completed due to some failure during the interpretation process.

Let us compare this to traditional views on presuppositions following Stalnaker (1974, 1978) as preconditions for a update of a body of information, usually taken to be the common ground. In this traditional view, the case of presuppositions as already given information is the default. In cases where a presupposition turns out to be informative, ie. not known to the hearer, a process of accommodation comes to rescue by adapting the body of information accordingly such that the precondition is nevertheless satisfied in a sense. My view of the matter is quite different, as indicated above. I take the case of informative presuppositions to be the default by regarding presuppositions as non-at-issue information. Crucially, the information state update of non-at-issue and at-issue information is exactly the same. The only difference lies in the obligation of the hearer to report on the at-issue update. As detailed above, this explains the various types of feedback behaviour one observes. In particular, failure of update with the ‘presupposition’ will lead to a special form of feedback, ie. to a ‘presupposition protest’. Furthermore, it will result in a failure to assign a truth-value to the at-issue material (which is has been described as inducing a squeamish feeling within the hearer by Strawson, 1964). Finally, in my view, the case of non-informative presuppositions (ie. those that are already supported by \( i \)) simply comes down to a vacuous update with the presupposed information. Again, since no feedback is required for this update, it will simply go unnoticed\(^6\).

\( ^6 \) Again this may be different for at-issue information where one could argue for a feedback that signals complaint about redundancy/uninformativeness in certain cases.
After this explication on presuppositions, let us turn to the missing parts of the information state update again. In the definition of this update I follow Kaufmann (2000), who puts forth the idea of using stacked contexts that facilitates a suppositional analysis of conditionals, but deviate from his account in crucial aspects concerning the handling of hypothetical information states. A stacked context is simply a sequence of information states.

**Definition 6 (Stacked Context)**
A stacked context is either the empty list `⟨⟩` or a pair `⟨i,σ⟩` consisting of an information state `i` and a stacked context `σ`. We write `⟨i⟩` in short for `⟨i,⟨⟩⟩`.

Stacked contexts can now be used to define the remaining instructions. In the present system, a `hyp` instruction creates a new information state on the stack that is used for subsequent updates until it is popped off the stack by the `□` instruction. The `⊥` construction clears the information state while `⊿` links the current target information state to its successor in the stack. As mentioned above, both non-at-issue and at-issue updates amount to the same basic update of the information state.

**Definition 7 (Update)**
Let `σ` be a (possibly empty) stacked context and `i` an information state. The update of a stacked context `⟨i,σ⟩` with an instruction is defined as follows:

(14) `⟨i,σ⟩[ϕ₁,...,ϕₙ] = ⟨i ⊕ ϕ₁ ⊕ ... ⊕ ϕₙ,σ⟩`

(15) `⟨i,σ⟩[accept(ϕ₁,...,ϕₙ)] = ⟨i ⊕ ϕ₁ ⊕ ... ⊕ ϕₙ,σ⟩`

(16) `⟨i,σ⟩[hyp] = ⟨i,⟨i,σ⟩⟩`

(17) `⟨i,⟨i',σ⟩⟩[⊃] = ⟨i,⟨i' - i,σ⟩⟩`

(18) `⟨i,⟨i',σ⟩⟩[□] = ⟨i ⊃ i',σ⟩`

(19) `⟨i,σ⟩[⊥] = ⟨∅,σ⟩`

Finally, the update of a stacked context `σ` with a sequence of instructions `X₁;...;Xₙ` is performed consecutively:

(20) `σ[X₁;...;Xₙ] = σ[X₁] ··· [Xₙ]`

As a last aspect, I assume that interpretation aborts whenever the hearer is threatened to reach the information state of inconsistency `⟨∅⟩`.

To illustrate these rules at work, consider (9) again. Processing the corresponding sequence in
(11) results in the following updates, where I assume the initial stacked context to be \((W)\).

\[
W[\text{smoke; hyp; accept(stop); hyp; accept(drink); } \triangleright; \bot; \square; \triangleright; \text{accept(happy); } \square]
\]

\[
= [\text{smoke}][\text{hyp; accept(stop); hyp; accept(drink); } \triangleright; \bot; \square; \triangleright; \text{accept(happy); } \square]
\]

\[
= ([\text{smoke}], [\text{smoke}])[\text{accept(stop); hyp; accept(drink); } \triangleright; \bot; \square; \triangleright; \text{accept(happy); } \square]
\]

\[
= ([\text{smoke} \cap \text{stop}, [\text{smoke}]])[\text{hyp; accept(drink); } \triangleright; \bot; \square; \triangleright; \text{accept(happy); } \square]
\]

\[
= ([\text{smoke} \cap \text{stop}, ([\text{smoke} \cap \text{stop}, [\text{smoke}]])][\text{accept(drink); } \triangleright; \bot; \square; \triangleright; \text{accept(happy); } \square]
\]

\[
= ([\text{smoke} \cap \text{stop} \cap \text{drink}, ([\text{smoke} \cap \text{stop} \cap [\text{smoke}]])][\text{accept(happy); } \square]
\]

\[
= ([\text{smoke} \cap \text{stop} \cap \text{drink}, ([\text{smoke} \cap \text{stop} \cap [\text{smoke}]])][\text{accept(happy); } \square]
\]

\[
= ([\text{smoke} \cap \text{stop} \cap \text{drink}, ([\text{smoke} \cap \text{stop} \cap [\text{smoke}]])][\text{accept(happy); } \square]
\]

\[
= ([\text{smoke} \cap [\text{stop} \cap [\text{drink} \cap [\text{smoke}]])][\text{accept(happy); } \square]
\]

\[
= ([\text{smoke} \cap [\text{stop} \cap [\text{drink} \cap [\text{smoke}]])][\text{accept(happy); } \square]
\]

As can be easily verified, the final information state is identical to the following proposition:

\[
[\text{smoke} \land (((\text{stop} \land \neg \text{drink}) \rightarrow \text{happy})]
\]

In other words, the hearer learns (1.) that John used to smoke and (2.) that Mary is happy if he stopped and Peter doesn’t drink. This is as desired. In particular, (1.) is the information conveyed by the presupposition triggered by \text{stop}, which projected from within the first conjunct and further from the antecedent of the conditional. In fact, this system produces in its current form nearly the same projection behavior as most satisfaction approaches to presuppositions (eg. Heim, 1983). For instance, in (21a) the factive verb \text{notice} triggers the factive presupposition that \text{Amy bites fingernails} in the consequent of a conditional. Satisfaction theories predict that this presupposition is projected and thereby conditionalized to \text{If Amy is nervous, she bites fingernails}. This system derives the same result.

(21) a. If Amy is nervous, Robbie will notice that she bites fingernails.

\[
\text{b. hyp; accept(nervous); } \triangleright; \text{ bite; accept(notice); } \square
\]

\[
\text{c. } W[\text{hyp; accept(nervous; } \triangleright; \text{ bite; accept(notice); } \square]
\]

\[
= \langle W, W \rangle[\text{accept(nervous; } \triangleright; \text{ bite; accept(notice); } \square]
\]

\[
= ([\text{nervous}], W)[\triangleright; \text{ bite; accept(notice); } \square]
\]

\[
= ([\text{nervous}], [\text{nervous}])[\text{bite; accept(notice); } \square]
\]

\[
= ([\text{nervous} \cap [\text{bite}, [\text{nervous}]])[\text{accept(notice); } \square]
\]

\[
= ([\text{nervous} \cap [\text{bite} \cap [\text{notice}, [\text{nervous}])][\square]
\]

\[
= ([\text{nervous} \cap [\text{bite} \cap [\text{notice}] \cup [\text{nervous}]
\]

\[
= ([\text{nervous} \rightarrow \text{bite} \land (\text{nervous} \rightarrow \text{notice})]
\]

One exception constitutes the case of conjunction which in this system projects presuppositions unaltered from the first and the second conjunct, whereas satisfaction theories also predict a conditionalized presupposition from the second conjunct. So while \(\varphi \land (\psi \land \partial \chi)\) is predicted to have
the presupposition $\varphi \rightarrow \chi$ in eg. (Heim, 1983), I predict it to project $\chi$ proper. In fact, while conditionalized presuppositions have been corroborated for conditionals and disjunctions by recent experimental research (Chemla and Schlenker, 2011), this is less clear in the case of and.

3 Information Structure

We are now at a point where we can implement the interpretative effects of information structure quite straightforwardly. I propose to treat topicality on a par with presuppositions while focus is taken to mark at-issue material. In terms of the system delineated above, we arrive at the following additional sequencing rules, where I assume that propositional constants corresponding to topical and focal material are marked by $[\cdot]_T$ and $[\cdot]_F$, respectively (as in the case of $\partial$-marking of presuppositional material).

**Definition 8 (Sequencing – continued)**

\[
\begin{align*}
\text{(S3)} & \quad \text{accept}(\Gamma, [\psi]_T, \Gamma') \rightsquigarrow \psi; \text{accept}(\Gamma, \Gamma') \\
\text{(S4)} & \quad \text{accept}(\Gamma, [\psi]_F, \Gamma') \rightsquigarrow \Gamma, \Gamma'; \text{accept}(\psi)
\end{align*}
\]

(S3) for handling topics is identical to (S1): topical material is treated as non-at-issue and hence subject to projection according to (S2). Focal material on the other hand constitutes the argument of an instruction and effectively causes all other material to be treated as non-at-issue as shown in (S4). In this sense, (S4) and (S1)/(S3) are complementary: while focus forces the marked material to occur as at-issue within an instruction, (S1)/(S3) forces marked material out of an instruction. We thus encounter a conflict of focus marking and presupposition marking. To resolve this conflict, I assume that they cancel each other out.

\[
\text{(22)} \quad \text{accept}(\partial \varphi)_F \rightsquigarrow \text{accept}(\varphi)
\]

Let us apply these rule by considering the minimal pair in (1) again, repeated here in (23a,c). If we assume that focus targets the presupposition in (23a) we encounter the above-mentioned conflict and hence cancellation wrt. sequencing. In (23b), however, the presupposition is unaffected and hence subject to sequencing.

(23) a. If the T.A. discovers that your work is [plagiarized]$_F$, I will be [forced to notify the Dean]$_F$.

\[
\begin{align*}
\text{b. } & \quad \text{assume}(\partial \text{plagiarize}, \text{discover}) \triangleright; \text{accept}([\text{forced}]_F); \square \\
& \quad = \text{hyp; accept(plagiarize, discover)} \triangleright; \text{accept(forced)}; \square
\end{align*}
\]

c. If the T.A. [discovers]$_F$ that your work is plagiarized, I will be [forced to notify the Dean]$_F$.

\[
\begin{align*}
\text{d. } & \quad \text{assume}(\partial \text{plagiarize}, [\text{discover}]_F) \triangleright; \text{accept}([\text{forced}]_F); \square \\
& \quad = \text{plagiarize; hyp; accept(discover)} \triangleright; \text{accept(forced)}; \square
\end{align*}
\]

Processing this sequence of instructions results in the desired update of the hearer’s information state:
The sequence of instructions for (23a) results in an update with the information that the hearer will fail, if his work is plagiarized and the TA discovers this. In contrast, (23c) will be understood to say that (1.) the hearer’s work is plagiarized and that (2.) he will fail if the TA discovers this, ie. with the factive presupposition (1.).

In order to deal with more complex cases, I shall extend the propositional system by introducing discourse referents. Those discourse referents will allow for a more fine-grained specification of the predicate-argument structure of clauses and for existential quantification. More precisely, I will take the arguments of instructions to come in the form of sequences of literals of the form $P(t_1, \ldots, t_n)$ where $t_i$ is a discourse referent or individual constant and $P$ a $n$-ary predicate symbol, allowing also for equality. To illustrate, the translation of (25a) containing focus marking on the object is given in (25b) (to which the sequencing rule (S4) for dealing with focal material will apply subsequently):

(25) a. John loves [Mary]$_F$

b. accept $(x = john, love(x, y), [y = mary]_F)$

Accordingly we need to extend the definition of an information state. Concerning interpretation of literals, I assume an underlying first order model (reflecting the hearer’s current knowledge state) where discourse referents are interpreted by partial assignments which assign every discourse referent in their domain an individual of the model. A possible world is again taken to take care of the interpretation of the constants such that we will write $[\phi]^{w,g}_w$ for the interpretation of $\phi$ wrt. world $w$ and partial assignment $g$.

Definition 9 (Information State)
Let $V$ be the set of partial assignments from the discourse referents to the domain of individuals of the underlying model. An information state $i$ is a set of world-assignment pairs $i \subseteq W \times V$ where all assignments in $i$ have the same domain.

Existential quantification is handled implicitly in this system by quantification of discourse referents on their first occurrence. In course of an update of an information state $i$ with $\phi$ this amounts to extending the domain of the assignments in $i$ by all discourse referents not already in the domain.

Definition 10 (Extending Assignments)
Let $\text{var}(\phi)$ be the set of discourse referents occurring in $\phi$. An assignment $g'$ extends an assignment $g$ to $\phi$ (noted $g'[\phi]g$) iff the following holds:

(26) $g'[\phi]g \iff \text{dom}(g') = \text{dom}(g) \cup \text{var}(\phi) \text{ and } \forall y \in \text{dom}(g) : g'(y) = g(y)$

It remains to specify the basic update of an information state $i$ with some literal $\phi$. Again the update is eliminative in that it discards all worlds from $i$ that cannot verify $\phi$ under any extension of the assignment it is paired with.
**Definition 11 (Basic Update)**

The basic update $i \oplus \varphi$ of an information state $i$ with $\varphi$ is defined as

$$i \oplus \varphi = \left\{ (w, g') \mid (w, g) \in i \text{ and } g' = [\varphi]_w g \text{ such that } \llbracket \varphi \rrbracket_w g' = 1 \right\}$$

For illustration, let us calculate the update for the result of (25b) after sequencing, i.e.

$$x = \text{john}, \text{love}(x, y); \text{accept}(y = \text{mary}).$$

We start again with the information state of total ignorance, consisting of the set of worlds $W$ and the empty assignment $\emptyset$.

$$W \times \{ \emptyset \}[x = \text{john}, \text{love}(x, y); \text{accept}(y = \text{mary})]
= \{ (w, g) \mid g(x) = [\text{john}]_w \text{[love}(x, y); \text{accept}(y = \text{mary})] \}
= \{ (w, g) \mid g(x) = [\text{john}]_w \text{ and } [\text{love}]_w(g(x), g(y)) \text{[accept}(y = \text{mary})] \}
= \{ (w, g) \mid g(x) = [\text{john}]_w \text{ and } [\text{love}]_w(g(x), g(y)) \text{ and } g(y) = [\text{mary}]_w \}$$

**Focus & Presupposed Background.** For a slightly more complex example consider (25b) embedded in the antecedent of a conditional (29a) together with the corresponding instruction sequence (29b) and the result of the update (29c).

(29) a. If John loves [Mary]$_F$ then Peter will be sad.

b. $x = \text{john}, \text{love}(x, y); \text{hyp;} \text{accept}(y = \text{mary}); \triangledown; \text{accept(sad(peter))}; \Box$

c. $\{ (w, g) \mid g(x) = [\text{john}]_w \text{ and } [\text{love}]_w(g(x), g(y)) \text{ and } g(y) = [\text{mary}]_w \text{ and } [\text{sad(peter)}]_w \}
\cup \{ (w, g) \mid g(x) = [\text{john}]_w \text{ and } [\text{love}]_w(g(x), g(y)) \text{ and } g(y) \neq [\text{mary}]_w \}$

The resulting information state is one that includes only worlds $w$ and assignments $g$ where (1.) John loves $g(y)$ in $w$, i.e. where John loves somebody. And (2.) if this somebody is Mary, then Peter is sad in $w$. Now note that (1.) is projected from the antecedent of the conditional due to the fact that this information is driven out of the accept instruction by the sequencing rule for focus in (S4). In other words, I derive in this system the projection behavior of the background to the focus. In the literature (cf. eg. Geurts and van der Sandt, 2004) this projection behavior has been taken as an indication for a presuppositional analysis, where presupposition is understood in the traditional sense. But while I submit to the reality of the projection behavior, I do not necessarily submit to the view that the background is presupposed in the traditional sense.

**Focus & Negation.** Another interpretative effect of focus marking along the same lines concerns it’s relation to negation. More precisely, negation seems to target focussed material. This is straightforwardly predicted in this system as the following example illustrates.

(30) a. It’s not the case that John loves [Mary]$_F$

b. $\text{accept( (a.) ) = reject( (25a) ) = (x = \text{john}, \text{love}(x, y); \text{hyp}; \text{accept}(y = \text{mary}); \triangledown; \bot; \Box)}$

The update will again result in an information state which supports that John loves somebody, but which excludes that this somebody is Mary. In other words, (sentential) negation will always cause a rejection of the focused information while the backgrounded material is projected.
Topicality & Exceptional Wide Scope. Let us now consider topicality. It has been argued that topicality is the decisive factor in the derivation of exceptional wide scope readings (Ebert and Endriss, 2004; Endriss, 2009) of indefinites. (31) is a sentence that exhibits such a reading. In this exceptional wide scope reading, the sentence says that there is a relative of the speaker such that the speaker inherits a fortune, if this relative dies. It seems that the indefinite a relative of mine takes wide scope out of the if-clause which can be termed ‘exceptional’ given that if-clauses are usually considered to be scope islands.

(31) If a relative of mine dies, I will inherit a fortune. (Fodor and Sag, 1982)

Endriss (2009) argues that indefinites show such exceptional scope readings if and only if they are aboutness topics of the sentences under discussion. In this case, so the analysis proceeds, they are interpreted as if originating in a separate speech act of topic introduction prior to the speech act of the original utterance. This is sketched schematically in (32), where a topic introduction act establishes a new discourse referent $X$ that is picked up in the original assertion.

(32) ASSERT(If [a relative of mine]$_T$ dies, I will inherit a fortune)  
$\leadsto$ TOPIC_INTRO($X$, a relative of mine) & ASSERT(If $X$ dies, I will inherit a fortune)

Clearly, such a treatment derives island-unbounded widest scope for the indefinite in question.

This behavior of topical indefinites also emerges in the present system. Consider (31) (with topic marking on the indefinite a relative of mine) again and its translation into the following instruction sequence where I assume the indefinite to translate as (implicitly existentially quantified) relative($x$).

(33) a. If [a relative of mine]$_T$ dies, I will inherit a fortune.

b. hyp; accept([relative($x$)]$_T$, die($x$)); $\triangleright$; inherit; $\Box$

This time it is the topic-marking itself that causes the indefinite to occur as non-at-issue information. Again this information is projected and the resulting information state is one where the existence of the relative is supported while it is conditional on whether this relative dies that the speaker inherits a fortune.

These data have caused (Cresti, 1995; Yeom, 1998, and others) to propose presuppositional treatments of exceptional wide scope indefinites. While such approaches can explain the projection-like behavior they must stipulate that the proposed presuppositions (eg. something along the lines There is a relative of mine for the example above) must be accommodated and can never be satisfied by context. This runs counter to the traditional view on presuppositions, where accommodation only kicks in after satisfaction failed, but it fits exactly with the view advocated here.

Topicality & Definite Descriptions. Finally, let us consider the relation of topicality and the existence presupposition attributed to definite descriptions.$^8$ Strawson (1964) has argued for such a

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$^8$I ignore the issue of uniqueness here.
presuppositional treatment but at the same time he pointed to an interplay of information structure and the presence of this presupposition. He used pairs like the one in (34).

(34)  a. The king of France visited the exhibition.

b. The exhibition was visited by the King of France.

While (34b) is judged false under the assumption that there is a salient exhibition and no King of France, hearers feel squeamish about (34a), ie. incapable of assigning a truth-value in the same context. On basis of this difference in truth-value judgements Strawson concluded that only the former exhibits this presupposition while the latter does not. He explained this by resorting to the topical status of the definite the King of France: only topical definites exhibit their existence presuppositions, while non-topical indefinites might be absorbed into the predicate which may in turn pave the way for a truth-value judgement (of the ‘false’ type). Indeed, if we follow the common observation that subjects make good aboutness topics, the topic of (34a) is the king of France, whose non-existence leads to a presupposition failure and hence squeamishness on the side of the hearer. On the other hand, the topic of (34b) is the exhibition and assuming that nothing contradicts the existence of a salient exhibition the presupposition will be satisfied (resp. accommodated).

Lasersohn (1993) and von Fintel (2004) argue against the proposed relation of the presupposition and topicality, while Ebert and Ebert (2010) argue against Lasersohn and von Fintel on basis of the approach to topicality by Endriss (2009) explained briefly above. In the present system, since both presuppositions and topicality come down to the same thing, the difference between a presuppositional construal and a fully semantic, Russellian construal vanishes for topic-marked definite descriptions. Assuming topic marking on the subjects in (34), we derive the following instruction sequences (treating the definite as simply existentially quantified).

(35)  a. $\text{accept}([\text{kof}(x)]_T, \text{visit}(x, y), \text{exh}(y)) = \text{kof}(x); \text{accept}(\text{visit}(x, y), \text{exh}(y))$

b. $\text{accept}([\text{exh}(y)]_T, \text{visit}(x, y), \text{kof}(x)) = \text{exh}(y); \text{accept}(\text{visit}(x, y), \text{kof}(x))$

Now assume that the hearer’s information state $i$ is not consistent with kof($x$), ie. the hearer has evidence against the fact that there is a King of France. In this case, the update of $i$ with (35a) fails on processing the first instruction, leading to ‘squeamishness’ and no further assessment of the following accept instruction, ie. no assignment of a truth-value. On the other hand, updating this very same information state with (35b) leads 1. to an update with the information that there is an exhibition (whether it is already supported by $i$ or not) and 2. to a failure to accept that the King of France visited the exhibition, resulting in negative feedback – which is exactly what we observe.

References

David Beaver. Have you noticed that your belly button lint colour is related to the colour of your clothing? In Rainer Bäuerle, Uwe Reyle, and Thomas Ede Zimmerman, editors, Presuppositions and Discourse. Essays offered to Hans Kamp, CRISPI. Elsevier, 2010.


On the projection behaviour of freely associating \textit{modf-} (“only”) in Bole (West Chadic)

Mira Grubic
SFB632, University of Potsdam

1 Introduction

Beaver and Clark (2008) propose a taxonomy of focus-sensitive elements according to their association behaviour: some elements \textit{conventionally} associate with focus, others \textit{freely}. Conventional association with focus is characterized by the fact that these particles need to associate with a focused constituent in their scope, whereas free association is pragmatic: freely associating elements may associate with non-focused constituents, if the context calls for this. In this paper, we adopt a model according to which discourse is structured by a hierarchy of (possibly implicit) \textit{questions under discussion} (Roberts, 1996; Beaver and Clark, 2008), such that focus indicates what the Current Question under discussion is.

\begin{enumerate}
\item A. (Who likes Bill?)
B. JOHN likes Bill.
\item A. (Who does John like?)
B. John likes BILL.
\end{enumerate}

In the case of conventional association, where the associate of the focus-sensitive element is always in focus, the Current Question thus straightforwardly asks for the constituent the focus-sensitive element associates with. In the case of free association, the indicated Current Question may ask for a constituent different from the one that the particle associates with. This is discussed in section 2.

This paper discusses the exclusive particle \textit{moâ-} (= “only”, “alone”) in Bole (West Chadic, A.1). When \textit{moâ-} associates with subjects, these can occur in their canonical preverbal position (3), instead of inverting, as they do when focused (4), indicating that this is a freely associating particle.

\begin{verbatim}
(3) Patu mot-to undak Ibiro
    Patu MO-3SG.F call.PFV.F Ibiro
    “Only Fatu called Ibiro.”

(4) Onu agoggo n Abu ye Patu
    Onu give.PFV watch to Abu BM Patu
    “FATU gave a watch to Abu.”
\end{verbatim}

The paper focuses on the projection behaviour of these freely associating particles. According to Simons et al. (2010), propositions which are \textit{not-at-issue} project. At-issueness is defined with respect to the Current Question: \textit{A proposition \textit{p} is at-issue if the speaker intends to address the [Current Question] via the question ‘whether \textit{p}’} (Simons et al., 2010). This definition leads to an interesting prediction for freely associating focus-sensitive exclusives: when their associate is out-of-focus, what projects should be disassociated from what the particles associate with, leading to different projection properties than for conventional association.

We compare the projection behaviour of \textit{modf-} with that of the conventionally associating exclusive particle \textit{only} in English. The first two sections present the two most important theoretical prerequisites - the distinction between conventional and free association (section 2), and projection (section 3), respectively. Section 4 discusses the predictions for the projection properties of freely and conventionally associating exclusive

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particles made by Simons et al. (2010)’s approach to projection, section 5 and 6 introduce the Bole data, and sections 7 and 8 present the analysis and conclusion.

2 Conventional and free association

Beaver and Clark (2008) introduce the terms conventional and free association with focus in a question under discussion (QUD) approach. They adopt the dynamic approach in Roberts (1996), under which the fact that the main goal of discourse consists in the sharing of previously unshared information is captured by modeling discourse as structured by possibly implicit (hearer-) questions.

(5) Q1 What is the way things are?  
     Q2 What is new about John? ...  
     Q3 Who does John like? ...  

According to Roberts (1996), the communicative goal to answer the question ‘What is the way things are?’ is met by recursively splitting it up into more manageable subquestions, which are called a strategy. Each superquestion entails its subquestions, i.e. a full answer to a superquestion also fully answers its subquestions. Each new declarative utterance answers the lowest question in the tree - the Current Question (CQ). The focus of the declarative utterance indicates what the Current Question is, by presupposing a congruent alternative set. The relation between the Current Question and the answer is restricted by a set of rules, securing relevance and congruence (Beaver and Clark, 2008):

(6) Current Question Rule: The Current Question must contain at least one true alternative, and contain multiple alternatives which are not resolved as true or false in the Common Ground.

(7) Discourse Principle: Utterances should be maximally relevant to the Current Question.

(8) Focus Principle: Some part of a declarative utterance should evoke a set of alternatives containing all the [focus] alternatives of the Current Question.

In conventional association, the dependency of a focus-sensitive element on focus is part of the lexical meaning of the element (e.g. Rooth 1985). In Beaver and Clark (2008)’s account, this means that the fact that the focus-sensitive element comments on the Current Question is part of its lexical meaning. In free association, alternatives are provided by the context (e.g. Roberts 1996). The main empirical difference is that conventionally associating elements must associate with focused constituents, whereas freely associating elements can associate with non-focused constituents in cases where other alternatives are provided by the context. Beaver and Clark discuss this using the example of freely associating always and conventionally associating only. They discuss different grammatical examples in which freely associating particles do not have a focused element they associate with in their scope, whereas conventionally associating particles are not possible in the same context. In the context of (9), the Current Question is ‘What do people who grow rice eat?’. The only possible constituent for only to associate with would thus be the weak pronoun it. This is however not possible, since it is inherently not focusable. Therefore, the sentence is infelicitous. Always, on the other hand, can quantify over situations in which people who grow rice eat, making (9b) felicitous.
For most accounts of projection, the distinction between conventional and free association with focus would not play a role in their predictions. The next section will however discuss an account of projection which links what projects with what isn’t asked for in the Current Question, and makes different predictions for freely and conventionally associating particles.

3 Projection

An inference is said to project when it survives embedding under an entailment-cancelling operator, e.g. the existential presupposition surviving embedding under negation, questions, and conditional operators in (10). Simons et al. (2010) propose a unified account of projection, which includes projection of presuppositions like the one triggered by the definite article in (10), and projection of conventional implicatures like the one triggered by damn in (11).

(10)  
   a. The dog isn’t on the couch.  
   b. Is the dog on the couch?  
   c. If the dog is on the couch, then Chris will be angry. 
   → There is a unique salient dog.

(11) The damn dog is(n’t) on the couch. 
    → The speaker’s attitude towards the dog is negative.

While these inferences arguably belong into different categories, and differ in terms of e.g. speaker-orientation, cancellability, and backgroundedness, Simons et al. (2010) suggest that the property of projection stems from the same cause: not-at-issueness. They suggest that operators like the negation only target at-issue content, and thus that implications that are not-at-issue project. Their definition of at-issueness (Simons et al., 2010, p.14) relies on the notion of the Current Question:

(12) A proposition p is at-issue iff the speaker intends to address the [Current Question] via the question ‘whether p’.

This can only be done felicitously if the question ‘whether p’ is relevant to the Current Question, i.e. only if it has an answer which contextually entails a partial or complete answer to the Current Question (Simons et al., 2010, p.8), and if this speaker intention is mutually recognized. Thus, in example (11), repeated here as (13), neither the question of whether there is a unique salient dog, nor of whether the speaker likes the dog or not is relevant to the Current Question, but the question of whether the dog is on the couch.

(13) The damn dog is(n’t) on the couch.
     At-issue content The dog is on the couch
     Presupposition There is a unique salient dog
     Conventional Implicature The speaker’s attitude towards the dog is negative.

The Current Question is indicated by the focus in the answer (Beaver and Clark, 2008), which could be on the PP, the VP, or on the whole sentence, and thus indicates a Current Question like ‘Where is the dog?’, ‘What did the dog do to make you angry?’ or ‘Why are you angry?’. The question whether the speaker’s
attitude towards the dog is positive or negative does not entail an answer to any of these questions, making
the speaker’s attitude towards the dog not-at-issue. Since negation only targets at-issue content, this meaning
component of the sentence projects. The same holds for the presupposition that there is a unique salient dog.
The linking of projection with relevance with respect to the Current Question makes interesting predictions
for free association with focus, which will be discussed in the following section. Before that, however, the
projection behaviour of conventionally associating exclusive particles will be discussed.

4 Projection behaviour of exclusive particles

4.1 Projection behaviour of conventionally associating only

In this paper, we will adopt a recent proposal by Beaver and Clark (2008) on the meaning of conventionally
associating exclusive particles. Beaver and Clark (2008) propose that the main function of these particles is
mirative: They mark the sentence in their scope (the prejacent) as (hearer-)unexpected.

(14) a. I was expecting John, Bill and Paul to come, but *only* John and Bill came.
    b. #I was expecting John to come, but only John and Bill came.

An informal representation of this meaning is given in (15) (Beaver and Clark, 2008, p.251).

(15) The lexical meaning of exclusives is exhaustively described by:
    a. Discourse function To make a comment on the Current Question (CQ [...] ), a comment which
       weakens a salient or natural expectation. To achieve this function, the prejacent must be
       weaker than the expected answer to the CQ on a salient scale.
    b. Presupposition The strongest true alternatives in the CQ are at least as strong as the prejacent.
    c. Descriptive Content The strongest true alternatives in the CQ are at most as strong as the
       prejacent.

This means that the sentence in (14a) (‘Only John and Bill came’) presupposes a scale of possible answers
to the Current Question on which the prejacent (‘John and Bill came’) is the weakest alternative, and then
asserts that it is the strongest alternative, thereby excluding all other alternatives which are still under con-
sideration. In (14b), there is a presupposition failure, leading to the rejection of the sentence.
This analysis of only can account for many puzzles that previous analyses of the projective meaning com-
ponent of only have faced. Horn (1969) proposes that an exclusive meaning component by which all other
alternatives are excluded is asserted, and the prejacent is presupposed. Using just the standard family of
sentences test for projection (Chierchia and McConnell-Ginet, 1990), e.g. embedding under negation, ques-
tions, and conditionals, the prejacent projects and thus seems to behave like a standard presupposition.

(16) a. It is not the case that only Muriel voted for Hubert.
    b. Did only Muriel vote for Hubert?
    c. If only Muriel voted for Hubert, John will win the election.
       → Muriel voted for Hubert.

However, in cases in which only is evaluative, its prejacent does not project (17).
Muriel isn’t only a graduate student, she is a post doc.

In Beaver and Clark (2008)’s analysis, in a positive sentence, the prejacent follows because it is the only alternative that remains. In negated sentences, the difference between the two kinds of only is due to the special nature of the scales under consideration. For the cases in which the prejacent projects, as in (16), Beaver and Clark (2008) propose that the presupposed scale is an entailment scale: every stronger proposition entails all weaker ones. Because of this, the prejacent, being the weakest considered proposition, is entailed by all alternatives. Since, due to the Current Question Rule, one of these alternatives must be true, it follows that the truth of the prejacent is not-at-issue (Beaver and Clark, 2008, p.265). It is presupposed, but indirectly, since this inference does not occur without the pragmatic rule. For the cases in which the prejacent does not project, as in (17), the presupposed scale is not an entailment scale, but a different ordering, in this case it is a scale ordered by the importance of the respective job. In this case, because the prejacent is not entailed by all considered alternatives, it is at-issue, which means that it does not project.

Another property which cannot be explained by Horn (1969)’s account, as Beaver and Clark (2008) point out, is that the prejacent cannot be cancelled, but may be suspended using modalized denial (18). In the cancellation case, an inference is annulated by explicitly stating that it is false, whereas in the suspension case, the speaker annulates an inference without committing to the inference’s truth or falsehood. According to Beaver and Clark (2008), both is usually infelicitous for presuppositions (18c-d).

(a) #Only Muriel voted for Hubert, but in fact, even she didn’t.
(b) Only Muriel voted for Hubert, and maybe even she didn’t.
(c) #Muriel stopped voting for Hubert, but in fact, she never voted for him.
(d) #Muriel stopped voting for Hubert, though maybe she never voted for him.

Beaver and Clark (2008) suggest that the prejacent cannot be cancelled because it is part of the core meaning of the utterance. Suspension, on the other hand, is possible because it is part of a hedging strategy – letting the hearer down gently –, by which first an utterance with only is used to weaken the hearer’s expectations, then the expectations are shattered completely.

This section discussed the projection properties of conventionally associating only. Summing up, when the alternatives in the Current Question indicated by focus form an entailment scale, the prejacent of only (i) is not-at-issue and thus projects, (ii) is suspendible, but (iii) not cancellable. The proposal by Beaver and Clark (2008) in (15) can account for these properties. The question raised in the next section is whether the same properties are expected for freely associating exclusives like mod-

4.2 Predictions: Projection & free association?

Roberts (2010) adopts a variant of Beaver and Clark (2008)’s account, in which an exclusive particle freely associates with focus, such that the alternatives on the scale on which the prejacent ranks lowest are not provided by the Current Question, but are contextually provided. In many cases, due to the salience of the Current Question, the contextually provided alternatives will correspond to those of the Current Question. In other cases, the contextually provided alternatives will differ from the Current Question. This will become relevant for our analysis of Bole, since – as will be shown in the next section – it can be shown in Bole that the exclusive particle mod- can freely associate with non-focused constituents.

A problem arises in combining Roberts (2010) account with that of Simons et al. (2010). Recall that Simons et al. (2010) suggest that inferences which are not-at-issue project, where an inference is not-at-issue if it
does not (partially) answer the Current Question. For an account in which exclusive particles conventionally associate with focus (as suggested by Beaver and Clark (2008)), this is unproblematic: The alternatives introduced by focus with which the particle interacts are ordered on an entailment scale such that all possible answers entail the prejacent, the prejacent is then not-at-issue: it is true in all worlds under consideration. The projection of the prejacent crucially relies on the fact that the exclusive particle constrains the alternatives indicated by focus in a way that the prejacent is entailed by all alternatives under consideration. For free association of exclusive particles as in Roberts (2010)’s analysis, Simons et al. (2010)’s account runs into problems as soon as the exclusive particle associates with a constituent which is not in focus. The problem lies in the fact that the exclusive particle does not constrain the focus alternatives in any way – it operates on other, contextually given alternatives. The prejacent can however only be not-at-issue, and thus projective, if it is entailed by all alternatives under consideration. When the exclusive particle associates with an out-of-focus constituent, stipulating such an ordering of the focused alternatives seems to be unintuitive. It is thus predicted that, unless one wants to stipulate an entailment ordering for focus alternatives even if the exclusive particle does not associate with the focused constituent, the prejacent of freely associating exclusive particles does not project in cases in which the particle associates with a non-focused constituent. As we will see in the next section, however, contrary to these predictions, the prejacent of mod- behaves just like that of conventionally associating English only.

5 Freely associating mod- in Bole (West Chadic)

This section discusses focus and association with focus in Bole. First, some general properties of Bole will be pointed out (section 5.1), then we present the system of focus marking in Bole (section 5.2), and of association with focus (section 5.3), especially of mod- (“only”).

5.1 The Bole language

Bole is a West Chadic language of the ‘A’ branch spoken in North-East Nigeria by about 100’000 speakers (1990 census, Lewis 2009). It has been studied by a number of scholars, starting with a word list (Koelle, 1854), most extensively by Russell Schuh and Alhaji Maina Gimba, who have published a dictionary (Schuh et al., 2009) and are working on a grammar (Schuh and Gimba, forthcoming). Bole is a SVO(X) language with two tones: high and low\(^2\). In information structurally neutral sentences, the direct object must always immediately follow the verb (19). If an indirect object is a pronoun, however, it is incorporated into the verb (20) (Schuh and Gimba, forthcoming)\(^3\).

\[(19) \text{Ibiro onu agogo n Abu} \quad \text{Ibiro o-\textit{ni} agogo}\]
\[\text{Ibiro give.PFV.M watch to Abu} \quad \text{Ibiro give.PFV.M-3SG.M watch}\]
\[\text{“Ibiro gave a watch to Abu”} \quad \text{“Ibiro gave him a watch.”}\]

\(^2\)Unfortunately, we do not have recordings of the data in this paper, so the tones will remain unmarked in the following sections.

\(^3\)The following glosses from the Leipzig Glossing Rules (LGR) are used: 1,2,3 = 1st/2nd/3rd person; AGR=agreement; DEF = definite; DET = determiner; F=feminine; FUT=future; IMP=imperative; M=masculine; NEG=negation; NMLZ = nominalization; PFV=perfective; PROG=progressive; Q = question particle; REL = relative; SG=singular; SBJV = subjunctive. The following are not from the LGR: BM = background marker; DEP = dependent; HAB = habitual; INDEP = independent; TOT = totality extension
Aspectual information is indicated by the tone and length of the verb stem vowels (also depending on the verb class), suffixes, and presence or absence of preverbal subject agreement markers. The following examples stem from the class B verb p`at¯a (“to go out”) (Gimba, 2000).

(21) a. ´ıshi´ı 3. M `a 3. AGR go.out.FUT  
    p`et`e go.out. FUT (future)

b. ´a 3. AGR p´et´e go.out.HAB  
   (habitual)

c. ´ıshi´ı 3. M j`ıi prog p`et`e go.out.PROG  
   (progressive)

d. ´ısh´ı 3. M p`et´e go.out.SBJV  
   (subjunctive)

e. p`et`e  go.out.1MP  
   (imperative)

In the perfective, the verb agrees with the subject in gender and number.

(22) Ibiro onu give. M.PFV agoggo n Abu.  
    “Ibiro gave a watch to Abu.”

(23) Zara onak give. F.PFV agoggo n Abu  
    “Zara gave a watch to Abu.”

Some functional elements are right-headed, e.g. the negation and the definite determiner ye.

(24) temshi sa.
    sheep NEG  
    “Not a sheep.”

(25) temshi ye
    sheep DET.DEF  
    “The sheep.”

The data given in this section were elicited with four speakers in two fieldwork sessions in Maiduguri, Borno State and Potiskum, Yobe State (North-East Nigeria) in 2009 and 2010/2011, using the general framework of Matthewson (2004) for semantic fieldwork.

5.2 Focus in Bole

Similar to the West Chadic languages Ngizim and Ngamo, there is a subject-non-subject asymmetry in Bole focus marking (Schuh, 2005): the subject is inverted to a postverbal position when focused (26), whereas focused non-subjects remain in their canonical word order (27).

(26) Onu give. M.PFV agoggo n Abu ye Patu  
    “FATU (f) gave a watch to Abu.”

(27) Onak (ye) give. F.PFV BM agoggo n Abu  
    “She gave a WATCH to Abu.”

As seen in (26), there is no subject-verb gender agreement when the subject inverts. In (26) and (27), we see an additional morphological marker ye preceding the focused element, which is obligatory for focused subjects, but optional for focused non-subjects. The marker does not mark the following constituent(s) as focused, but the preceding constituent(s) as backgrounded (Schuh, 2005, 27). According to Schuh, the
source of this marker is the definite determiner, which is also leftward-oriented (cf. example (25) above). It also marks topics, conditional clauses, and _when_-clauses, which all precede the _ye_ marker.

The inverted subject can be in any position after the direct object, preceding or following indirect objects and adjuncts (28). When an indirect object pronoun is focused, it does not incorporate into the verb (29).

(28) Onu agoggo _ye_ Patu n Abu
     give.PFV.M watch BM Patu to Abu
   “FATU (f) gave a watch to Abu.”

(29) Ibiro onu agoggo _n ishi_
     give.PFV.M watch to 3SG.M
   “Ibiro gave a watch to HIM.”

To summarize, focused subjects are inverted, and the background is morphologically marked, whereas non-subject focus is not obligatorily marked – not even prosodically (Schuh et al., 2010). In the following section, the obligatory inversion of focused subjects will be used to differentiate between free and conventional association with focus: when a particle associates with a preverbal subject, this is free association.

5.3 Association with focus in Bole

As mentioned in section 5.2, focused subjects are obligatorily focus marked by inversion to a post-VP position. The possibility of (seemingly) associating with a subject in its preverbal position is thus a reliable test to differentiate free and conventional association with focus in these languages: conventionally associating particles should only be able to associate with inverted, and thus focused, subjects, whereas freely associating particles should in principle be able to associate with preverbal subjects in appropriate contexts. Evidence for this is given from the closely related SubjF-inversion language Ngamo (Grubic and Zimmermann, t.a.): In Ngamo, the particle _yak_ (= “only”) can only associate with inverted subjects, but not with subjects in their preverbal position (30), which we take as evidence for its conventional association behaviour. In contrast, the Ngamo particle _ke_ (= “also”) can associate with preverbal subjects (31), and thus freely associates with focus.

(30) #Kule _yak_ on-ko agoggo ki Abu.
     Kule YAK give-PFV watch to Abu.
   (NOT:) “Only Kule gave a watch to Abu.”

(31) _Kule_ _ke_ on-ko agoggo ki Abu.
     Kule KE give-PFV watch to Abu.
   “Kule gave a watch to Abu, too.”

Further evidence for this difference between _yak_ and _ke_ comes from association with weak pronouns. In Ngamo, like in Bole, unstressed indirect object pronouns are incorporated into the verb. The freely associating particle _ke_ can associate with weak, unstressed indirect object pronouns (32), whereas the conventionally associating _yak_ can only associate with strong, non-incorporated pronouns (33).

(32)  [Context: Whom did Kule give a watch?] Onko agoggo _i_ ki Dimza, _ke_ ono agoggo.
     give-PFV watch BM to Dimza KE give-1SG watch
   “He gave a watch to Dimza, and also gave a watch to me.”
(33) [Context: Did Kule give a watch to all of them?]
   a. #O'o, Kule onto agoggo yak'i.
      No Kule give-3SG.F watch YAK
      (intended:) “No, Kule only gave a watch to HER.”
   b. O'o, Kule onko agoggo -i ki te yak'i.
      No Kule give-PFV watch BM to 3SG.F YAK
      “No, Kule only gave a watch to HER.”

The corresponding data for mod- in Bole indicate that this particle freely associates with focus, too (34). mod- follows its associate, but not necessarily immediately, and takes a pronoun suffix which refers to its associate, whereby d always assimilates to the first sound of the suffix. It can associate with a weak, incorporated IO pronoun (cf (35)), which supports the claim that it associates freely.

(34) [I thought that Fatu and Goro called Ibiro, but..]
      MO-3SG.F Fatu call.PFV.F Ibiro
   b. Patu mot-to undak Ibiro.
      Patu MO-3SG.F call.PFV.F Ibiro
   c. Patu undak Ibiro mot-to.
      Patu call.PFV.F Ibiro MO-3SG.F
      “Only Fatu called Ibiro”

(35) [Did Mamadi give us a watch?]
   A’a, ishi on-ka mok-ko.
   No 3SG.M give.PFV-2SG MO-2SG
   “No, he only gave it to you.”

We have shown that in contrast to the Ngamo exclusive yak’i, Bole mod- is a freely associating particle. The question we want to address in this paper is whether freely associating particles like mod- differ in their projection behaviour from conventionally associating particles, which always associate with focus.

6 Projection Properties of mod-

The results of a fieldwork session using a questionnaire taken from Beaver et al. (2009) reveal that – contrary to the predictions made in section 4.2 above – the projection properties of these freely associating particles are the same as those reported for English only in Roberts (2010) and Beaver and Clark (2008).

As shown in (36), a sentence with mod- cannot have an evaluative reading. If it were a conventionally associating particle, the prejacent would be predicted to project in all cases.

(36) Q: [Are you a student at this university?]
     A: Inna n pokara mon-ni sa, n malum
        1SG.INDEP 1SG.DEP student MO-3SG NEG 1SG teacher
        “I am not only a student, I’m (also) a teacher.”
        (Comment: this means that the speaker is a student as well as a teacher, it cannot mean that
         the speaker is not a student.)
In a first group of tests, it was found that the prejacent of *mod*-globally projects when embedded under negation, interrogation, and conditionals.

(37) a. **Goro** a poro bo nasara *mot-to* sa.  
    Goro 3.AGR speak language European MO-3SG.F NEG  
    “It is not the case that only Goro speaks English”

b. **Goro** a poro bo nasara *mot-to* do?  
    Goro 3.AGR speak language European MO-3SG.F Q  
    “Does only Goro speak English?”

c. **Ba Goro** *mot-to* a poro bo nasara ye, ngoropi la ndinko Germany  
    if Goro MO-3SG.F 3.AGR speak language European BM stranger REL come.PFV Germany  
    a wa’ina damuti.  
    3.AGR get.NMLZ bothering  
    “If only Goro speaks English, the German foreigner will face trouble.”  
    → Goro speaks English.

Like the prejacent of English *only*, the prejacent of *mod*- is not cancellable (38), but suspendable (39).

(38) *Muna* *mot-to* a poro bo nasara, amma Muna a poro bo nasara  
    Muna MO-3SG.F 3.AGR speak language European but Muna 3.AGR speak language European  
    sa.  
    NEG  
    “Only Muna speaks English, but Muna doesn’t speak English.”

(39) **Muna** *mot-to* a poro bo nasara, kai le ita mayi a poro sa.  
    Muna MO-3SG.F 3.AGR speak language European maybe even 3SG.F indeed 3.AGR speak NEG  
    “Only Muna speaks English, and perhaps not even she.”  
    (Comment: First you say that among the people in the community only Muna speaks English, then  
    you change your mind and say that even she doesn’t speak English)

Tonhauser (2011) proposes a classification of projective meanings based on the local effect and contextual felicity of the projective inference. These properties, their corresponding tests and the results for *mod*- in Bole will be discussed in the following two subsections.

6.1 Local Effect

The tests for local effect discussed in Beaver et al. (2009) have to do with the projection of an inference embedded under a filter (Karttunen, 1973), like the consequent of a conditional. In these constructions, projective inferences usually survive, except if it is made explicit from the global context that the projective inference does not hold there. Then the projective inference is only locally true. This can be seen in the following example from Simons et al. (2010).

(40) [Context: Said by a person who doesn’t know Patrick, but is in his home while he is away]  
    If Patrick is a cellist, he must have taken his cello (because there’s none here).
In (41), mod- is in the consequent of a conditional, the antecedent of which makes explicit that the speaker doesn’t know whether the prejacent of mod- holds. The prejacent of mod- thus has local effect: It can hold locally in cases in which it does not hold globally.

(41) Ba har ga meemu la na a pora bo nasara, to Goro mot-to a if even exists person REL REL 3.AGR speak language European so Goro MO-3SG.F 3.AGR poro bo nasara.
speak language European
“If there is anybody that speaks English, then only Goro speaks English.”

6.2 Contextual felicity

Another property used for classifying projective meanings is its potential informativity or contextual felicity. The idea is to test whether a sentence triggering a projective inference can be felicitously uttered if that projective inference is not in the Common Ground. Some projective inferences, like the existential inference of also, are constrained to contexts in which the inference is in the Common Ground, whereas others, like the prejacent of only, aren’t. In Tonhauser (2011), inferences like the existential inference of also are said to have a contextual felicity constraint, whereas the prejacent of only is unconstrained.

(42) A: Who came to the party? B: #Also JOHN (came).
(43) A: Who came to the party? B: Only JOHN.

The prejacent of mod- behaves like that of only: It can be new information (44), and is also felicitous in contexts in which the speaker explicitly admits that (s)he does not know whether the prejacent holds (45).

(44) A: [Who is it?] B: Eme inna mon-no.
It.is 1SG MO-1SG
“It is only me.”
(45) A: [Does Muna speak English?] B: N monu sa, amman mon-tu ba har ga meemu la a poro 1SG know.PFV NEG but 1SG know.PFV-TOT if even exist person REL 3.AGR speak bo nasara sa ton i-tu yakkin Muna mot-to a poro ye. language European NEG so 1sg do.PFV-TOT attentiveness Muna MO-3SG 3.AGR speak BM
“I don’t know, but since nobody else speaks English, I’m sure that only Muna speaks English.”

The prejacent of mod- thus has no contextual felicity constraint.

6.3 Classification

According to Tonhauser (2011)’s classification, there are the three classes of projective meanings shown in table 1. She shows that the prejacent of only belongs to class C, in English as well as in Guaraní. Up to now, we have discussed projection, contextual felicity, and local effect, and have shown that mod- behaves like English only in this respect, and can thus be grouped into class C, too.
Table 1: Three classes of projective meanings (Tonhauser, 2011, p.2)

<table>
<thead>
<tr>
<th>Classes</th>
<th>Projection</th>
<th>Not-at-issue</th>
<th>Contextual Felicity</th>
<th>Local Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>B.</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>C.</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

What we have purposefully left open until now is a discussion of the at-issueness of the prejacent of *mod*. The results for this property were not conclusive, and will be discussed in the following section.

6.4 Not-at-issueness

The main claim of Simons et al. (2010) is that projective meanings are not-at-issue. Beaver et al. (2009) test this by looking at whether the prejacent can be targetted by direct affirmation or denial. For English, this is infelicitous for the prejacent of *only* (46).

(46) A: Does only Goro speak English?
    B: #No, she doesn’t speak English / No, Asabe speaks English, too.

For Bole, on the other hand, this seems to be perfectly felicitous (47).

(47) A. Goro a poro bo nasara ye *mot-to?*
      Goro 3.AGR speak language European BM MO-3SG.F
      “Does only Goro speak English?”
    B: A’a, ita ye ma monak pora bo nasara ye sa.
       no 3SG.F BM indeed know.PFV.F SPEAK language European BM NEG
       “No, she doesn’t know how to speak English”

(Comment: The first person is expecting Goro to speak English, and the second person corrects this assumption: she doesn’t.)

In Roberts (2010) and Tonhauser (2011), new tests for at-issueness were devised, further work will tell whether these will show more conclusive results.

7 Analysis

It was suggested in section 4 that the combination of an account of free association with focus with Simons et al. (2010)’s account of projection leads to the prediction that the prejacent of the exclusive particle *mod* in Bole would not project in cases in which the particle associates with preverbal, out-of-focus subjects. The previous section has shown that contrary to these predictions, the prejacent of sentences with *mod* behaves exactly the same as the prejacent of sentences with English *only*: (i) it projects when embedded under negation, questions and conditionals, (ii) it has local effect, i.e. it can hold locally even if it does not hold globally, and (iii) need not be entailed by the Common Ground for the utterance to be felicitous. If one does not want to stipulate that focus on e.g. the VP indicates alternatives with an entailment ordering, this leaves...
two options for consideration. First, Simons et al. (2010)’s account could be changed such that at-issueness is not be defined with respect to the Current Question, but with the contextually given alternatives that the freely associating particle ranges over. The other, more preferable option is that what is focused is not the whole sentence, or the VP, but the focus-sensitive particle, indicating a Current Question like in (48).

(48) a. How (i.e. with how many people) did John come?
    b. ONLY John came.

This is parallel to the following example mentioned by Roberts (2010) and attributed to Abbott (2000), where focus on a manner adverb leads to the projection of the rest of the sentence.

(49) If Hans nodded SLOWLY, he’s not in full agreement.

→ Hans nodded.

Evidence for the second analysis, at least for final mod-, comes from examples in which the language consultant introduced explicit background marking. Recall that the particle ye marks the immediately preceding constituents as backgrounded, and that the immediately following constituents constitute the focus of the utterance. When consultants introduce overt background marking into a sentence with preverbal subject, they mark the prejacent as backgrounded, and the focus-sensitive particle as focused.

(50) A: [Did Zara and Ibiro call Abu?]
    B: A’a, Zara undak Abu ye mot-to.
    no Zara call.PFV.F Abu BM MO-3SG.F
    “No, only Zara called Abu.”

Further fieldwork will tell whether this analysis is true for all cases of free association of mod- with a preverbal subject.

8 Consequences and Outlook

The data presented in the last sections are evidence for Beaver and Clark (2008)’s differentiation between conventionally and freely associating particles presented in section 2. It was shown in section 5 that since Bole mod- can seemingly associate with preverbal subjects, which are out-of-focus, mod- is a freely associating particle (in contrast to the exclusive yak in the closely related language Ngamo, which can only associate with inverted subjects). This calls for an analysis like the one proposed by Roberts (2010), in which the alternatives which the particle interacts with are contextually given (cf. section 4). It was also suggested in section 4 that a combination of this account with Simons et al. (2010)’s account of projection, according to which projective inferences are not-at-issue with respect to a Current Question (cf. section 3), would predict that the prejacent does not project in cases in which mod- associates with out-of-focus preverbal subjects, unless one would stipulate that focus alternatives are ordered on an entailment scale. The tests in section 6 show, however, that the prejacent projects. In section 7, we proposed that this is due to focus on the exclusive adverb itself, making the prejacent backgrounded and thus not-at-issue.
References


Embedded Speech Acts are Scopeless

Tim Hirschberg
Goethe-University Frankfurt am Main

0. Point of Departure: Inherently Scopelessness

Besides traditional presuppositions, non-restrictive relative clauses (NRRC) are known to be projective, i.e. they do not interact with logical operators in whose scope they appear. One way to bring this out is to use the ‘family of sentences test’ (Chierchia & McConnell-Ginet 2000: 349ff.):

(1) Lars, who is from Sweden, likes creamed herring.
   a. Does Lars, who is from Sweden, like creamed herring?
   b. Perhaps Lars, who is from Sweden, likes creamed herring.

Neither the interrogative (1a) nor the modal (1b) do affect the content of the NRRC, and the same is true if NRRCs are embedded under other entailment-cancelling operators. What is important is that the property to take global scope is more rigid compared with presuppositions. NRRCs always seem to project past filters and plugs (e.g. attitude complements). For instance, the filter if does not allow presuppositions to project from its consequent clause, if they are implied by the antecedent:

(2) If Lars marries Emma and gets children, then his daughters will have a wonderful mother.

In (2), the existential presupposition that Lars has some daughters does not survive. By contrast, NRRCs are never conditionalized under any filters (ex. from Beaver et al. 2009):

(3) #If Mary is indeed an American, then Mary, who’s from Ithaca, loves gorges.

(3) is infelicitous because the speaker first raises doubts about Mary’s American descent, but then asserts that she’s from Ithaca (New York), i.e. from America. Notice that the conjoined equivalent of the NRRC can be, of course, interpreted as modified by the epistemic conditional:

(4) If Mary is indeed an American, then she’s from Ithaca and loves gorges.

In the following sections, I will discuss possible ways to account for the robust resistance to scope interactions. I will particularly argue against a recent attempt to state projection properties in purely
pragmatic terms. As an alternative, I suggest to relate projection behavior to the presence/absence of an independent illocutionary force.

I. Ways to Account for the Widest Scope Behavior: The Pragmatic Turn

The syntactic properties of NRRCs may be regarded as paradoxical. On the one hand, they share the behavior of root-clauses, which explains the absence of ‘weak crossover effects’ (Safir 1986). On the other hand, NRRCs are subordinated on the surface form. In SOV languages like German, the verb of a NRRC must stay at the final position. This constraint is active in clearly integrated constructions like restrictive relative clauses. In light of these observations, both ‘orphanage’ (Burton-Roberts 1999; Emonds 1979; Fabb 1990) and integrated accounts (Arnold 2007; Jackendoff 1977) have serious disadvantages. Either the non-root characteristics are not accounted for or certain semantic properties do not fall out directly from the syntactic analysis.

One way out of this dilemma is to shift the burden of explanation from syntax to semantics. Truth-conditional irrelevance may be something worth paying attention to. NRRCs don’t combine with their head noun through set intersection, i.e. they don’t affect the truth-conditions of the whole utterance. If it is assumed that operators are only sensitive to truth-conditional components of meaning, then the wide scope behavior follows naturally. A more articulated semantic explanation for the peripheral properties of NRRCs is given by Potts (2005). According to him, NRRCs express a special kind of meaning which is backgrounded (not-at-issue) and computed in a separate dimension from assertive content. In Potts’ so-called logic for conventional implicatures (triggers are, besides NRRCs, honorifics, as-parentheticals, etc.), the not-at-issue status has a type-driven explanation. NRRCs don’t belong to the basic types e, t, and s, but are connected to an autonomous series, indicated as distinct via a superscript ‘c’ on the type name. Objects that are typed with these superscripts cannot serve as input for at-issue operators. This explains the scopally inertness of NRCs, while the syntax remains surface-true. Recently, however, Potts’s proposal has come under increased criticism as will be shown below.

Pragmatic approaches generally agree with Potts’ view that NRRCs display a special epistemic status. But not-at-issueness is derived in a completely different way. According to Simons et al. (2011), it depends solely on the discourse structure (defined in the sense of Roberts 1996). Only information which is relevant to the current question under discussion (QUD) is at-issue, and only this kind of information does
interact with the various natural language operators. The hypothesis aims not only to explain the projection behavior of presuppositions, but of the full range of projective meanings, including NRRCs.

The merely pragmatic view of projection has received considerable attention in the recent literature (Amaral et al. 2007; Nouwen 2011; Simons et al. 2011; Schlenker 2010). This is what I will call the ‘pragmatic turn’. The various accounts, to be sure, differ in detail, but they all agree in that projection properties are flexible depending on the context. I will argue, however, that at least for NRRCs this assumption cannot be maintained. In order to make this point, I have to show that some NRRCs may in fact convey at-issue propositions, while their projection behavior remains constant. This will be dealt with in the next section.

II. a. NRRCs that answer the QUD

As is well known, NRRCs cannot normally resolve an overt question even if their content provides all the relevant information:

(5) What does your friend like?
   – #My friend, who likes Finnrock, lives in Helsinki.

But there exist two exceptions to this generalization. First, if a question contains more than one wh-word, the NRRC may address one of them:¹

(6) Was hat Angela Merkel bestellt und wo sitzt sie?
   'What did Angela Merkel order and where is she sitting?'
   – Merkel, die Languste bestellt hat, sitzt an Tisch Nummer 7.
   – 'Merkel, who ordered the crawfish, is sitting at table number 7.'

Second, if the matrix clause carries ‘little informational content’ and the NRRC is located at the right edge, it may even provide an exhaustive answer to a single overt question:

(7) Wieviele Steuern müssen wir noch nachbeziehen?
   'How much back taxes do we have to pay?'

¹ For reasons of native language proficiency, I switch to German examples.
II. b. A Problem for the Discourse Based Account to Projection?

Both in (6) and (7), the content of the NRRC seems to be at-issue. (6) is an instance where multiple propositions may be regarded as having this status. By contrast, in (7), only the NRRC expresses the main point of the utterance while the matrix proposition is negligible. So if the discourse based (QUD) account to projection is on the right track, there should be no hindrance to semantically embed examples like the above ones. However, this prediction is not borne out:

(8) Es ist nicht der Fall, dass Merkel, die Languste bestellt hat, an Tisch 7 sitzt.
‘It is not the case that Merkel, who ordered the crawfish, is sitting at table 7.’

(9) Vielleicht war ich vorhin beim Finanzamt, das noch 2000 Euro verlangt.
‘Perhaps I was just at the tax office, which still demands 2000 Euros.’

Regardless of the (at least partial) relevance to the QUD, the NRC does neither in (8) nor in (9) fall under the scope of the negation or the modal adverb, respectively.

II. c. Apparently At-Issue Status

The fact that projective interpretations of NRRCs cannot be suppressed in contexts like the ones above was already noticed by Simons et al. (2011). But they do not consider such data to be counterevidence to their proposal. Instead, they refine the definition of at-issueness. Besides relevance to the QUD, it is the ‘intention of the speaker’ that determines what becomes at-issue. Furthermore, the intention has to be identifiable by the hearer.

This new version might well offer an explanation for the absence of scopal interaction effects in (6). The double wh-question, to be sure, leaves it open which part constitutes the topic of the discourse. From the perspective of the questioner, it is unspecified whether the first or the second question counts as the ‘higher’ one. But from the perspective of the responder, only a single atomic proposition is presented as primary, namely the one which is packed into the matrix clause. If it is indeed the intention of the actual speaker that determines at-issueness status, then examples like (6) are only ‘apparently at-issue’.
The same argumentation does not carry over to (7) because there the context provides only a single overt question. It cannot easily be assumed that the responder connects the information contained in the NRRC to a less important, not-at-issue question. To deal with cases like this, Simons et al. (2011) argue that higher questions can be reconstructed via a pragmatic repair mechanism. This works, roughly said, as follows: The material of NRRCs is conventionally marked as not-at-issue. If it nevertheless resolves an overt question, the hearer recognizes a mismatch between linguistic form (marked as not-at-issue) and information structural status (at-issue). In order to overcome this mismatch, an implicit higher question relative to which the NRRC is not at-issue is reconstructed. The separate steps of this process are given below:

(7’) How much back taxes do we have to pay?  

I was just at the tax office, which still demands 2000 Euros.  

Mismatch between linguistic form and information structure → Reconstruction of a new QUD & reanalysis of the previous QUD.  

How much back taxes do we have to pay? & How do you know about that?  

Once the implicit question is identified, the situation is similar to that of the example with the double wh-word. The speaker of (7’) does in fact address two questions, but only the implicit one related to the matrix proposition is relevant to the main conversational goal. Therefore, the NRRC is again only apparently at-issue and the discourse based account of projection can be maintained, regardless of scopally inertness.

II. d. At-Issue Meaning that must Project

I have a principle objection against this line of reasoning. It arises from the standard observation that not-at-issue material cannot be targeted felicitously by simple, straightforward denials, whereas the reverse is true for at-issue (‘what is said’) components of meaning:

(10) It was Lars who kissed Emma.  

No, that’s not true.
In (10), the rejection cannot be taken to pertain to the existence presupposition triggered by the cleft sentence, i.e. it is not contradicted that ‘someone’ kissed Emma. A more effortful strategy is needed to remove the backgrounded bit of information from the discourse representation (cf. von Fintel 2004):

– Hey, wait a minute, I had no idea that someone kissed Emma!

The varieties of denial and affirmation mechanisms are sensitive to the information structural partition of an utterance (Spenader & Maier 2009). As a consequence, susceptibility to direct contradiction/affirmation is – besides relevance to the QUD – a decisive measurement for at-issueness status. This poses a serious problem for the claim that in (7``), the NRRC is only apparently at-issue:

(7``) Ich war vorhin beim Finanzamt, das noch 2000 Euro verlangt.
– Stimmt nicht, es verlangt noch 4000 Euro. ‘No, it still demands 4000 Euro.’

The information about the total back taxes can be targeted felicitously both by simple denial and affirmation. In this sense, there is no difference in principle between the NRRC and normally asserted at-issue content. It indeed seems to be the speaker’s intention to set out the material contained in the NRC separately to make it challengeable for the addressee. I see therefore no evidence that the matrix proposition should be related to an implicit question as an escape hatch to avoid a mismatch. Instead, the details about the source of the information regarding the taxes merely serve as an opening frame before the central point of the utterance is made through the NRRC.

I conclude that clause-final NRRCs are in fact counterevidence to the claim that at-issue meaning is necessarily non-projective. Projection behavior cannot be stated purely in discourse-pragmatic terms.

III. Alternative Accounts to Projection

There remain the semantic and the syntactic strategy to account for the global-only projection behavior of NRRCs. In what follows, I will focus on the semantic part of the discussion and leave aside syntactic issues.

III. a. Problems for the Multidimensional Account
According to Potts’ multidimensional model already outlined above, widest scope behavior is a result of semantic independence. He argues that NRRCs belong to a dimension which is rigidly separated from at-issue content. However, the literature has provided substantial evidence against the prediction that the boundary is valid for any semantic phenomena (Amaral et al. 2007; AndersBois et al. 2011; Karttunen & Zaenen 2005; Schlenker 2010; Wang et al. 2005). Here I confine myself to one problem with the independence assumption and refer the reader to the original articles for more details. Consider the following sentence from AndersBois et al. (2011):

(11) John, who saw Mary, saw Susan too.

In (11), the presupposition that John saw someone different from Susan is satisfied by the content of the NRRC, i.e. the main clause cannot be determined independently. Notice that the felicity of (11) cannot be traced back to an accommodation mechanism that applies regardless of whether the NRRC is present or not. Additive particles like too strongly resist accommodation in out-of-the-blue contexts (van der Sandt & Geurts 2001):

(12) #John saw Susan too.

What makes the evidence from boundary-crossing phenomena even more compelling is that these processes operate in both directions:

(13) John saw Mary, who saw him too.

Hence, although Potts’s approach might be well suited to predict the projection properties of NRCs, it is problematic on independent grounds.²

III b. Problems for the Truth-Conditional Account

² Notice, however, that the data sketched above do not falsify the claim that NRCs are scopally inert. One has to distinguish between semantic impact that is dynamic (i.e. cross-clausal, e.g. modal subordination, telescoping, discourse anaphora) and impact that is truly scopal (i.e. intra-clausal). Obviously, presupposition satisfaction belongs to the former phenomenon: John saw Mary. She saw him too.
The view that scopally inertness is connected to truth-conditional irrelevance is at first blush appealing. Consider, for instance, so called complex demonstratives (expressions of the form ‘that X’). The descriptive material following the demonstrative pronoun seems to contribute nothing to the truth conditions of the whole utterance:

(14) That cat is eating goldfish crackers.

The demonstrative pronoun alone is sufficient for directly picking out the referent. This is true even if the speaker of (14) is mistaken and the animal in question is not a cat at all (Larson & Segal 1995). The nominal element merely has a pragmatic function in helping the hearer to assign reference, just like an accompanying pointing gesture. What is interesting with respect to projection is that complex demonstratives seem to behave precisely like NRRCs. Their descriptive component radically escapes from the syntactic environment (Dever 2001).

Moreover, the truth functional approach to projection might also clarify some puzzling observations regarding nominal appositives (NA). These constructions were among the first which were cited as counterevidence to Potts’ independence assumption (Wang et al. 2005). In the following sentence, the NA receives a reading within the scope of the negation (ex. from Nouwen 2011):

(15) It is not the case that a boxer, a famous one, lives in this street.

By contrast, if the anchor of the NA is a proper name, the interaction effect disappears and the content of the NA must be evaluated above the negation:

(16) It is not the case, that Jack, a famous boxer, lives in this street.

The difference follows straightforwardly, if it is assumed that operators target only truth-conditional components of meaning. While in (15), the NA restricts the set of boxers the utterance is about, in (16), it cannot constrain what the anchor refers to because proper names are rigid designators.

However, there are instances where NAs appear to undergo scope interactions even if an inherently specific expression serves as their head. Sæbø (to appear) claims that de dicto interpretations are not only possible but preferable, if a NA is embedded within an intensional downward-entailing context:

(17) Mary could not believe that she, a virgin, would have a child.
But judgments from attitude and say reports are a notoriously difficult area. First, it is no easy task to exclude the possibility that the de dicto reading of (17) is connected to ‘hidden quotation’ – a form of perspective shifting not tied to semantic binding. On this view, the speaker of (17) would use the words of the NA echoically, thereby shifting the context for their evaluation from the current to the source context. Second, examples like (17) give rise to a two-sided interpretation: both the grammatical subject (Mary) and the actual speaker of the utterance must believe that Mary is a virgin. The first belief appears to be construed internally, i.e. as belonging to the scope domain of the adversative verb. By contrast, the source of the second reading is external. How these inferences come into existence is an open matter. This is also a topic in the research on presuppositions (Heim 1992; Loar 1972; ex. from Geurts 1999):

(18) Louise doubts that her niece lives in Leeds.

From an utterance of (18) one infers that Louise has a niece (external) and that she believes that she has one (internal). It is far from obvious that both parts should be accounted for in presuppositional terms. Geurts (1999: 163ff.) argues that the internal reading is just an epiphenomenon, based on a pragmatic process called ‘importation’. According to this view, the information from the external presupposition, which is logically prior, spills over into the attitude context, i.e. the internal reading is independent of any scopal relation. It may well be that importation is also responsible for apparent de dicto interpretations of NAs in downward-entailing environments. This would be in accordance with the view that these constructions are global-only projective. I will leave this for further research and turn to cases of focus association which are easier to evaluate.

Some focus-sensitive operators in German can freely interact with prosodically marked elements of NAs, regardless of the nature of the anchor:

   ‘Markus doesn’t even know Adenauer, the FIRST Chancellor.’

3 Geurts assumes that the importation strategy is connected to a principle of charity. As he puts it, “we try to avoid the conclusion that other people’s beliefs are contradictory, we credit them with knowledge that we take to be uncontroversial or commonly available […]”.

4 Capitalization marks focal stress.
(19) yields the interpretation that Markus ‘certainly’ does not know the <second-, third-, fourth-…n-th> Chancellor of Germany, i.e. a properly ordered scale related to semantic strength does arise (the likelihood to know a scale-value decreases from left to right). The focally stressed numeral introduces a specific set of ranked alternatives of which the complex scalar particle *nicht einmal* ‘not even’ makes use of (see Schwarz 2005 for an in-depth analysis of this particle). Notice that the interaction with the focus operator must be of truly scopal nature because the same reading cannot be obtained with dynamic (inter-clausal) mechanisms. This comes out when the paratactic pendant of (19) is taken into account:


ʻMarkus doesn’t even know Adenauer. Although he was the FIRST Chancellor.’

The second sentence of (20) sounds slightly odd with the focal stress being placed on the numeral. What is important however, is the absence of the fine-grained scale in contrast to (19). The focus induced alternatives cannot pass across the sentence boundary and there is no discourse-mediated way to construct an appropriate scale. This finding leads to the conclusion that even non-restrictive NAs do engage ‘real’ scope interactions. Truth-conditional relevance/irrelevance is therefore not the decisive factor projection behavior depends on.

### IV. Proposal: The Speech Act Account to Projection

My point of departure is the striking similarity between NAs and NRRCs. It is often claimed that the former should be regarded as an elliptical variant of the latter (Dever 2001; Doron 1994; Heringa 2009). On this view, NAs contain a covert relative pronoun and a silent copula with the meaning of _be_:  

(21) Ruben, my teacher, is a nice person. ≈ Ruben, who is my teacher, is a nice person.

But this analysis cannot be wholly accurate; otherwise the projection behavior would be the same. This prediction is not borne out as is shown below:

(22) Markus kennt [nicht einmal] Adenauer, der unser ERSTER Bundeskanzler gewesen ist.

ʻMarkus doesn’t even know Adenauer, who has been our FIRST Chancellor.’

(22) yields an interpretation, that is clearly different from the example with the NA (19). Something prevents the association between the accented numeral and the focus operator. As a consequence, the
utterance gives a similar impression of oddity as the paratactic sequence (20). The focus induced alternative cannot percolate beyond the NRRC and no ordered scale is introduced.

Hence, NAs and NRRCs are not in a relation of equality. I suggest treating them instead as a minimal pair. They differ in only one property, namely the presence/lack of an independent illocutive force. While NRCs form speech acts by their own, NAs do not. Crucially, it appears to be this single difference that makes NAs scopally flexible, and NRCs necessarily projective.

There exists a systematic restriction regarding the combinatory potential of additional speech acts. As Hooper & Thompson (1973) suggested, speech acts cannot be semantically embedded. This claim may be too strong because some logical operations over speech acts do in fact occur. For instance, Krifka (2001) shows convincingly that quantification into question acts is a possibility (see Krifka (to appear) for further examples). But in general, resistance to scope interactions is a striking feature of many expression types which only have in common that they perform independent speech acts. These include vocatives (Portner 2007), left and right dislocation (Averintseva-Klisch 2006), and topics (Bianchi & Frascarelli 2009), among others.

Note that my proposal hinges on two assumptions: the first is that NRCs are indeed speech acts in their own right, and the second that NAs lack this feature. The first part of these requirements is unproblematic. NRCs have the ability to host sentential adverbs (frankly, luckily, etc.) and their illocutive force can differ from that of the main clause. Moreover, the presence of explicit performative expressions is fully acceptable (Horn’s (2008) example): 5

(23) The qualifications of this woman, whom I hereby nominate, are unquestionable.

But the second part of the requirements is a challenge. NAs appear to license both illocutionary force indicators and performatives:

(24) Racial profiling, unfortunately a frequent occurrence in American society, must be stopped.
    (example from O’Connor 2008)

5 As Horn observes, this is a knock-down argument against the attempts to subsume NRRCs under the heading of ‘presuppositions’.
(25) OptoTest Corp, hereby referred to as OptoTest, and the purchaser, hereby referred to as BUYER, agree to the following terms as binding for all matters concerning rental equipment. (Web example)

There is, however, evidence from German that a more fine-grained analysis is needed. This becomes obvious when case facts are considered:

(26) Jule muss das Zimmer [mit ihrem Bruder]_{Dative} (*leider) [einem Idioten]_{Dative} teilen.  
   'Jule has to share the room with her brother, unfortunately an idiot.'

(27) Jule muss das Zimmer [mit ihrem Bruder]_{Dative} leider [ein Idiot]_{Nominative} teilen.

The sentence is clearly ruled out, if leider ‘unfortunately’ co-occurs with a NA that agrees in case with its anchor (26). The generalization is that illocutionary force indicators are only licensed if there is a case mismatch between the NA and the anchor (27). Based on that, I suggest defining a classification of the following scheme:

I. Case-agreeing NAs, which lack an independent illocutionary force.
II. Non-agreeing NAs, which are speech acts in their own right.

The attempt to develop more detailed classifications of NAs is not new (Potts 2005: 108). But to my knowledge it hasn’t been noticed that the separate types deviate from each other with respect to projection properties. Non-agreeing NAs endowed with an independent illocutive force are akin to NRCs, i.e. they are scopally inert. By contrast, agreeing NAs which have a dependent force are flexible to some degree. This explains why focus association is only possible under case identity ((19′), repeated for convenience):

(19′) Markus kennt nicht einmal [Adenauer]_{Akkusative} [den ERSTEN]_{Akkusative} Bundeskanzler.

V. Conclusion

NRRCs resist scope interactions more robustly than other projective constructions. This behavior falls out straightforwardly from syntactic orphanage accounts, but only at the cost of obscuring central surface

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6 They take the nominative case (the default form in German) and can indeed be analyzed as elliptical NRCs. Probably, it is hard to keep the two kinds of NAs distinct in languages with a deteriorated case system.
facts (verb-last position, linear adjacency). Integrated accounts must, in turn, resort to non-standard syntactic manipulations to derive the root-features. On the semantic side, there is the multidimensional and the truth-conditional account to projection. The former makes too strong predictions with respect to the possibility/lack of interactivity (presupposition satisfaction); while the latter wrongly predicts that all non-restrictive expressions are invisible for operators (focus association with NAs). The aim of this paper was, however, a critical survey of the pragmatic account to projection (dependence on (not-)at-issue status). It was argued that the global-only projection behavior of NRRCs cannot be stated in purely pragmatic terms. Some clause-final NRRCs convey ‘real’ at-issue propositions, nevertheless the ban on scope interactions remains constant. As an alternative it was suggested that projection behavior is connected to the feature of illocutive force: constructions that constitute separate speech acts necessarily scope out.

References


1 Introduction

In addition to explicit truth-conditional meaning, corresponding to Grice’s (1989) ‘what is said’ and Potts’ (2005) ‘at-issue content’, natural languages allow one to express indirect or implicit information, which comprises at least presuppositions (PPs) and implicatures, whether conventional (CIs) or conversational (cis). Although there a covert consensus that these different layers of meaning are ‘peripheral’ in some sense, this common intuition is either not elaborated at all or spelled out in heterogeneous ways in the literature. Recently, there has been a move towards providing a unified approach to indirect/implicit meaning. The goal of this paper is to review and diagnose the two main proposals in this direction and to show that a unified approach to projective meaning is indeed possible, by combining insights from the two perspectives. In the next section, I review some evidence from the literature that presuppositions and implicatures behave in similar ways in at least three respects, projection, refutation and attachment. In section 3, I review the approach of (Beaver et al., 2010) and turn to that of (Jayez, 2010) in section 4. Finally, in section 5, I offer a new proposal based on a probabilistic view of discourse linking.

2 Basic observations

PPs, CIs and cis share three kinds of observational properties. First they tend to project, that is, to remain endorsed by the speaker under negative, interrogative and certain modal operators. In (1), all three sentences presuppose that Paul had been smoking. See Geurts (1999) for an overview.

(1) a. I doubt that Paul stopped smoking.
   b. Did Paul stop smoking?
   c. Mary hopes that Paul stopped smoking.

The same behaviour can be observed with CIs in the sense of (Potts, 2005). Epithets, particles, non-restrictive relative clauses, determiners, adverbs can convey a CI (Chierchia and McConnell-Ginet, 1990; Davis and Potts, 2010; Harris and Potts, 2010; Jayez and Rossari, 2004; Jayez, 2005; Jayez and Tovena, 2008; Potts, 2005; Wharton, 2003; Wilkins, 1992).

(2) a. It is not true that my stupid neighbour voted for Smith
       ⇒ my neighbour didn’t vote for Smith
       ~ my neighbour is stupid.
   b. Did Paul almost hit the target?
       ⇒ The distance between the impact and the target was not significant.
       ~ Paul didn’t hit the target.

cis can also manifest projection, as noted by (Simons, 2005).
A – Are we going on a picnic?
B – It’s raining.
C – It’s not raining. / Is it raining?

B and C’s answer → rain makes picnic less probable

However, this seems to be limited to elements of background knowledge. Scalar implicatures are known to be unstable in the presence of negation.

The second property common to PPs, CIs and cis is the fact that a direct refutation is preferably interpreted as about the asserted content, and not about the PP, CI or ci. This was observed for PPs by Erteschik-Shir and Lappin (1979) and von Fintel (2004), a.o., and was shown to extend to CIs, see for instance (Jayez and Rossari, 2004; Potts, 2005).

(4) A – Paul has stopped smoking.
B – No. / It’s false. / You’re wrong. / You lie.
\quad ~ He still smokes, \not\sim He didn’t smoke before

(5) A – Fortunately, Paul has stopped smoking.
B – No. / It’s false. / You’re wrong. / You lie.
\quad ~ He still smokes, \not\sim He didn’t smoke before, \not\sim It is unfortunate that Paul has stopped smoking

cis exhibit the same restriction

(6) A – Paul answered some questions
B – No. / It’s false. / You’re wrong. / You lie.
\quad ~ He didn’t answer any question, \not\sim He answered all of them

It is of course perfectly possible for B to refute a PP, a CI or a ci insofar as she indicates explicitly the target of the refutation, often with a metalinguistic flavour.

(7) A – Paul answered some questions.
B – No, he answered ALL the questions.

Finally, PPs, CIs and cis tend to escape discourse attachment. Ducrot (1972) observed that it is difficult to use a discourse marker to connect to presuppositions. He called this restriction loi d’enchaînement (‘linking law’). Jayez (2005, 2010) generalises the observation to implicatures.

(8) a. Paul stopped smoking because he liked that.¹
\quad \not\sim Paul smoked because he liked that

b. My stupid neighbour had an accident although my sister thinks he is smart.
\quad \not\sim He is stupid although my sister thinks he’s smart

A – Is David Beckham a great player?²
B – ?? He’s a good player although he was nominated for the Golden Ball.
\quad \not\sim DB is not a great player although he was nominated for the Golden Ball

¹There exists a perfectly admissible interpretation of the example, which can be paraphrased by ‘Paul stopped smoking because he liked that too much and was afraid of becoming an addict’.

²This example is an elaboration from an example by Hotze Rullmann.
Summarising PPs, CIs and cis share a common profile with respect to projection, refutation and attachment. This raises the question whether it is possible to unify the three categories in some way. The next two sections present two different attempts in this direction. In the rest of the paper, in order to avoid some confusions, I’ll use a neutral terminology, denoting the meaning contribution of PPs, CIs and cis by the generic expression of Non-Main Content (NMC). The term Main Content refers to the rest of the meaning contribution, including explicatures Jayez (2010).

3 The QUD theory

The first theory I examine is based on the idea that the NMC does not in general address the Question Under Discussion (QUD), and that, when it does, it loses its projection property. Its most recent version is formulated in (Beaver et al., 2010) and I’ll call the theory that is presented there the QUD theory. The basic idea behind the QUD theory is that only things that are not interpreted as related to the QUD can project. If I am not mistaken, the intuition behind this idea is that the NMC is, in a sense, tangential to the main flow of discourse. More precisely, if we see discourse as an attempt to make the uncertainty of a given set of possibilities decrease, the NMC remains in general external to the contributions that serve this goal. I summarise the main tenets of the QUD theory in (9)

(9) \[ Q = \text{the belief state corresponding to the QUD}, \quad C = \text{the context}. \quad ‘⊕’ \text{ notes the operation of eliminative update.} \]
1. What is at-issue (= related to the QUD) cannot project. What is not at issue can.
2. If \( p \) is related to a QUD \( Q =_u \?p \), then \( p \) has an answer that contextually entails a partial or complete answer to \( Q \). In symbols, \( \exists r(p \models_C r \land Q \oplus r \subset Q) \) or \( \exists r(\neg p \models_C r \land Q \oplus r \subset Q) \).
3. The speaker can reasonably expect the addressee to recognise her intention to address the QUD with \( p \).

Let us browse through a couple of examples to illustrate the way the theory works. First, consider the following dialogue.

(10) A – What most surprised you about the first graders?
B – They didn’t know that you can eat raw vegetables.
(Beaver et al., 2010, ex. 15)

The PP that one can eat raw vegetables is not a plausible answer to the QUD. So, it can (and actually does) project. Let \( p \) be the proposition that first-graders know that one can eat raw vegetables. We have, trivially, \( p \models_C p \), \( \neg p \models_C \neg p \). \( \neg p \) addresses the QUD directly: \( Q^{\text{What most FG}} \oplus \neg p \subset Q^{\text{What most FG}} \). So, \( p \) is related to the QUD and, as a result, cannot project, which entails that it is wiped out by negation. Note that, in addition, there is no reason to doubt that B intends to address A’s question through \( p \).

Let us now detail a slightly more complex example, with a definite description in the role of the PP trigger.

(11) A – Why aren’t you inviting any boys from your class to the party?
B – I don’t like the boys in my class.
(Beaver et al., 2010, ex. 25)
B’s answer presupposes the existence of boys in the class. An apparent problem is that, if there is no boy, we have a very sensible answer to A’s question, namely ‘because there are no boys in my class’. So, the question ‘are there any boys in your class?’ has a negative answer that makes the uncertainty attached to the set of possible reasons for not inviting any boy decrease. Why does it project, then? Beaver et al. point out that, if speaker B had really intended to mark a relation to A’s question by using the definite description the boys in my class, he would have used a different linguistic structure, since the structure of B’s answer indicates by default that the existence of boys in the class is not at-issue. If I understand this reasoning correctly, it entails that when a speaker has a choice, she should not use a structure where the part that is supposed to be related to the QUD is conventionally marked as unrelated to it by default.

Is there evidence that projection is blocked when the NMC addresses the QUD? Beaver et al. mention examples like the following.

(12) Q1 – Does France have a king?
A1 – Well, the king of France didn’t attend the opening of Parliament.
   \[ \text{If France had a king, he would have attended the ceremony} \]
Q2 – Is Harry dating Sally?
A2 – Bill doesn’t know that he is.
   \[ \text{If Harry dated Sally, Bill would know it} \]

The QUD theory is intuitively appealing and empirically robust, since, in most examples, the NMC is indeed not used to address the QUD. However, its predictions are too strong. Let us return for instance to the first-graders example (10) and consider the following variant.

(13) A – Why were you so surprised by the first graders?
B – Because I was not aware that \( p \): they didn’t know that you can eat raw vegetables.

\( p \) is related to the QUD. \( Q \) is the set of possible reasons for being surprised by the first graders and, clearly, \( p \) projects. Intuitively, it seems that B’s answer is perfectly transparent: B is surprised because she was not aware that \( p \), so the MC and the NMC are both relevant to the QUD. One might be tempted to relax Beaver et al. criterion by saying that the NMC cannot project when it addresses the QUD by itself, without the collaboration of the MC, which is not the case in (13). I am unsure about examples like (12), though. The conditional gloss offered by Beaver et al. entails that the MC plays a role in making the uncertainty decrease. Yet the PPs are assumed not to project.

The next two examples exemplify the same configuration. In (14), it is difficult to claim that the NMC does not address the QUD. The problem is rather to understand why B and C add some apparently irrelevant information, namely that they have just realised or had not realised that it rains\(^3\). In (15), the existence or non-existence of linguists in the room is relevant to the question why Mary was so cool. Yet the PP projects.

(14) A – What’s the weather like?
B – I have just realised that it’s raining.
C – I had not realised it’s raining.

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\(^3\)I conjecture that these indications may suggest that the speaker is unable to make precise at what time the rain started.
(15) Context: Mary doesn’t like linguists
   A – Mary was incredibly cool!
   B – She didn’t notice the linguists in the back, you know.

4 The no-attachment theory

In (Jayez, 2010), I adopted a different perspective, which does not rely on the notion of QUD. In fact, the approach emerged in part as a reaction to a previous version of (Beaver et al., 2010) and, in the present paper, I adapt it to take into account the most recent version. There are two possible objections to Beaver et al. proposal.

First, along the lines of (Ducrot, 1972), one observes that attachment to the NMC is strongly dispreferred whether it addresses the QUD, as in (16) and (17), or not, as in (18). These and similar examples show that the specific interaction with the QUD is not the only characteristic property of the NMC.

(16) A – What’s the weather like?
    B – ?? I had not realised it’s raining, since the road is wet.
        Intended: it’s raining since the road is wet.

(17) A – What’s the weather like?
    B – ?? It’s almost raining, since the road is not wet.\(^4\)
        Intended: it’s not raining since the road is not wet.

(18) A – What’s the weather like?
    B – ?? Unexpectedly, it’s almost raining, since it was sunny five minutes ago.
        Intended: It’s unexpected since it was sunny five minutes ago.

One important point is that it is much more difficult to attach to the NMC alone than to the MC alone.

(19) a. Paul has stopped smoking because he liked that
    Cannot mean that Paul smoked because he liked that (MC ignored)

   b. Paul has started smoking because he likes that
    Cannot mean that John didn’t smoke because he likes or liked smoking

A second problem is that, as noted in the previous section, sometimes, a NMC that should not project—because it is related to the QUD—does project. Interestingly, the alleged counterexample in (Jayez, 2010), repeated in (20), is flawed, since the environment of the PP is not a projective one.

(20) A – Does Paul has a strong will?
    B – Yes, he has stopped smoking for instance

One can easily build parallel cases with a projective environment. The main point of both types of example is that the answer to A makes use of the NMC and the MC.

\(^4\)One may manipulate the MC to get a more natural answer: It’s just almost raining since the road is not wet.
A – Does Paul have a strong will?
B – No, he has not stopped smoking for instance.
C – Well, are you aware that he is a chain-smoker?

In view of these problems, Jayez (2010) proposes that that what distinguishes the MC from the NMC is the property of obligatory attachment. If we have two discourse constituents α and β, any discourse relation between them must attach $MC(\alpha)$ and $MC(\beta)$. It can also involve $NMC(\alpha)$ and $NMC(\beta)$, but this is not obligatory and depends on the discourse relation and the context. Like the QUD theory, obligatory attachment to the MC is compatible with Grice’s (1989, p. 121, p. 362) idea that speech acts can have a central and a peripheral component. Unlike the QUD theory it interprets centrality as an attachment constraint.

There are several possible objections to Jayez’s proposal. First, it seems that, in certain cases, the NMC alone addresses the QUD. If we assume that the question-answer pair conveys a discourse relation, the constraint of obligatory attachment to the MC is violated. For instance, in (22), the PP that Mary is clever is a direct answer to A’s question.

(22) A – Do you think Mary is clever?
B – Her husband regrets every day that she is

Actually, things are not so simple because one has to show that the MC is really ignored. A possible interpretation of (22) is that Mary is so clever that she is a problem for her husband, in which case the MC is involved. When one tries to get rid of the MC, examples are much less natural.

(23) A – Do you think Mary is clever?
B – ? Her husband forgot that she is

An objection in the same vein is the perfectly natural character of examples like (24).

(24) a. Since Paul has divorced, he was married
b. Since Paul has stopped smoking, he has been smoking

Examples like (24) are essentially ‘metalinguistic’, meaning that they connect the use of a term, or in Horn’s (1985; 1989) Dummett-like terminology, the assertability of a sentence, and its consequences. A relevant symptom is that it’s extremely difficult to impose a causal interpretation involving the MC and the NMC in such environments (25). This is to be expected, if the meaning of (24) is something like ‘if the concept of being divorced / having stopped smoking applies to Paul, then one must conclude that he was married / he has been smoking’. Under this form, the MC is the proposition that a certain concept can be appropriately applied to an individual. A similar comment applies to metalinguistic refutations (Paul is not divorced since he never married)?

(25) a. ?? Paul has divorced, this explains why he was married and is not
b. ?? Paul has stopped smoking, this explains why he has been smoking and does not

Another type of objection concerns the examples of type (19). One might argue that the impossibility of

5I cannot discuss this problem in a significant way here, see (Lee, 2005) for a recent study. Surprisingly, although Horn and Dancygier (1998, sec. 3.5) discuss conditionals under a metalinguistic interpretation, they do not mention examples of the type If John is divorced, he has been married.
attaching to the NMC in (19) simply results from the type of mismatch mentioned in (Beaver et al., 2010),
namely that such an attachment would force the NMC, which does not normally address the QUD, to do so.
But what does ‘normally’ mean? We have a choice here. We might admit the existence of an attachment
constraint and the difference with (Jayez, 2010) would become rather thin. Or we might extend the constraint
on projection and include non-projective environments, saying that the NMC cannot address the QUD and
be considered as true at the same time. In that case, (20) would be a counter-example since the NMC
addresses the QUD and is considered as true all the same.

The last objection I consider is more serious. The obligatory/preferred attachment to the MC depends
in fact on the particular discourse relations that are supposed to hold between discourse constituents. For
instance, Winterstein (2010) shows that too and its French counterpart aussi can use the NMC as an an-
tecedent.

(26) Paul knows that Harry is dating Sally, he is dating her too.

It is also possible to construct examples of Elaborations (Asher and Lascarides, 2003) where the discourse
relation revolves around the NMC. For instance, in (27), the temporal precision concerns the PP.

(27) Paul knows that Harry is dating Sally, it started in June (Elaboration)

In fact, it turns out that the discourse relations that strongly limit attachment are what I call relevance dis-
course relations. Explanation, Justification, Opposition, Result (or Consequence) are examples of such rela-
tions. Their common property is that they connect propositions whose probabilities may be (inter)dependent.
I assume here that (inter)dependence is basically what (Merin, 1999) calls relevance, hence the name rele-
vant discourse relations. A proposition $p$ is positively (negatively) relevant to another proposition $p'$ when
updating the current belief state $S$ with $p$ results in a state $S \oplus p$ where $p'$ is more (less) probable than it was
in the initial state $S$. Moreover I consider only ‘relevant relevance’, that is, Merin-relevance relations where
no proposition is superfluous. For instance, if $\mu_r$ is the relevance measure and $\mu_r(p, p') = \mu_r(p \& q, p')$
with $\mu_r(q, p') = 0$, I do not consider $p \& q$ to be relevant to $p'$ but only $p$. Since I will use Bayesian
networks, relevance will be defined in a different way but, at root, the intuition is the same. I have now to
explain what aspect of the MC-NMC distinction produces the particular attachment restrictions observed
with relevance discourse relations. This is the topic of the next section.

5 A probability-based approach

The intuition I develop in this section is the following. Languages allow users to mark the ‘central’ or
‘peripheral’ status of different pieces of information. The terms ‘central’ and ‘peripheral’ do not refer to
the importance of the contributions per se. They represent the communicated expectations of the speaker
concerning the probable modifications triggered by her discourse. I illustrate this idea with a standard
example of presupposition. If John says Paul stopped smoking to Mary, he does at least three different
things.

1. He communicates that he believes that Paul does not smoke and that he has been smoking.

6This is the sense of relevance familiar from substructural logics where the left weakening schema $A, B \vdash A$ is not a rule of the
system. The relevance logic of Anderson and Belnap and the linear logic of Girard are well-known examples.
2. He communicates that he expects Mary to consider revising her belief state with the proposition that Paul does not smoke and with the proposition that Paul has been smoking.

3. He communicates that the main content is involved into any discourse continuation that depends on relevance as explained in section 4.

The first two points are standard. By asserting something, the speaker communicates that she entertains certain beliefs and that she expects the addressee to change her own belief accordingly (see Stalnaker (1978) for instance). The only change I introduce is the use of revision rather than eliminative update. I don’t want to commit myself to the view that participants have only two options, integrating new information or getting a contradiction, as is the case with eliminative update. They can also change their mind and make adjustments in their belief state, see (Williams and Rott, 2001) for a general introduction and (Baltag and Smets, 2008) for the interaction between revision and probability. The third point concerns the structure that the speaker assigns to discourse. The main difficulty here is to discern the nature of the attachment constraint. I claim that it is a congruence phenomenon, parallel to what has been studied in the literature on questions. It is well-known (see for instance Roberts (1996); von Stechow (1990) and much subsequent literature) that the background-focus structure of an answer must normally replicate that of the question.

\[(28)\] A – Who won the race?
B – Paul. \(BG = \lambda x. \text{won-the-race}(x), F = Paul\)
C – Paul won the lottery.

\[(28C)\] does not qualify as an answer to \((28A)\) unless we derive some implicature such as ‘Paul did not win the race’ (he won the lottery instead). And this is because \(\lambda x. \text{won-the-lottery}(x)\) cannot be unified with the property of winning the race, which is available in the (pre)supposition of the question\(^7\). The (possible) mismatch between \((28A)\) and \((28C)\) may appear trivial, but it is not entirely so. Actually, the origin of the mismatch is not only the absence of congruence but the quasi-impossibility of changing the QUD or, more generally, the discourse topic, without signalling the change explicitly. If the discourse participants had the possibility of shifting freely the discourse topic, C could decide that she prefers to answer the question of who won the lottery. Certainly, her answer would not count as an answer to \((28A)\), but the non-congruence would not matter as long as we are able to abduce a new question. We should not get confused at this point. Abducing a new question is not necessarily problematic. Human beings are extremely gifted for abduction and prove quite capable to hypothesise goals or reasons for which they don’t have direct evidence. The impression of extreme awkwardness that \((28C)\) may engender is not caused by the impossibility of producing an appropriate question, but by a non sequitur effect.

Quite similarly, in \((29)\), it is impossible to understand B’s answer as meaning that Paul married Sophie precisely because he loved her. The NMC is inaccessible in spite of the fact that it would help to construct a perfectly sensible answer to A’s question.

\[(29)\] A – Paul has divorced. I wonder whether he ever loved Sophie.
B – Yes, he divorced precisely because he loved her.

The case of (N)MC is complicated by the role of relevance. Why are the attachments limitations much more sensitive to relevance relations than to Elaboration or Addition? On this point, the situation is different from the congruence requirement in question-answer pairs. At the time the question has been issued, the

\(^7\)See (Buring, 2004) for a discussion of the (non-)presuppositional status of the background part of questions
congruence pattern is in general determined. It is not so for attachment since ‘congruence’ depends in this case on the discourse relation(s) that will gain prominence when the second constituent has been issued.

The intuition that emerges from the previous sections is that the MC is, in some sense, conventionally marked for discourse integration. Unfortunately, this intuition is extremely vague and even potentially misleading. Models of discourse integration often use the traditional distinction between cohesion and coherence. Cohesion concerns primarily the referential links across a discourse—a text or a conversation. Coherence requires identifying what a discourse is about, setting up a situation model in the terms of van Dijk and Kintsch (1983). Cohesion is not at issue in the distinction between MC and NMC since, for instance, presupposed material allows for bridging and, in this respect, is not different from MC, see (30).

(30) Paul divorced. His marriage was not very happy, I think.

The role of coherence is more difficult to appreciate because its exact content varies with the theory of discourse relations one adopts, see (Renkema, 2009, section 8.4). In the limit of this paper I only need to clarify the general function that the MC/NMC distinction serves. MC marks this part of information that the speaker intends as involving relevance. Intentions in communication are a huge topic which I won’t even try to address. I am interested only in public intentions, that is, those that a participant makes manifest to others and to which she is committed. A public intention is made manifest by way of a message and is defined in (31). I assume discourse states $D$, which describe the status of each participant (private beliefs, image of the common ground, etc. see Ginzburg (2011)). $D[m|\phi]$ indicates that updating a discourse state $D$ with message $m$ leads to a state where $\phi$ is true. $m_{a>b}$ indicates that $a$ sends a message to $b$.

(31) \textbf{Public intention}  \\
\hspace{1cm} $a$ makes manifest her intention that $\alpha$ through $m =_{df} D[m_{a>b}] Bel_b Bel_a (\Pr(\alpha|m) > \Pr(\alpha))$

In definition (31), I limit myself to describing intentions as beliefs about the probability of an effect. I also ignore the shared belief structure which is usually taken to result from manifest communicative actions such as public announcements (van Ditmarsch at al., 2008).

The next step is to provide a plausible content for $\alpha$ in the context of relevance. I assume, quite generally, that for a proposition to intentionally involve relevance, it is necessary and sufficient that the speaker manifestly believe that the message she sends is likely to cause an adjustment in the probabilistic belief and action structure of the receiver. A popular class of models for interaction in communication is the family of BDI\textsuperscript{8} models, see for instance (Wooldridge, 2000). Each agent is assumed to be characterised by a complex network of beliefs, desires and intentions, which changes along time in function of events such as context modifications (external events) and messages. In standard BDI models, the network is defined in Boolean logic, by way of logical entailment. However, nothing prevents it in principle to be defined as a Bayesian structure, more precisely a Bayesian network, in the terminology introduced by (Pearl, 1985). There is at the moment no empirically grounded (‘realistic’) model of human BDI-like connectivity, I mean of the neural implementations that support those behavioral sequences that we describe as intentional. Experimental work has to focus on well-delimited tasks, which do not involve much context exploitation or rich linguistic material, see (Carter, Hodgins and Rakison, 2011) for a good illustration. So, we have to live with acceptable metaphors, that provide a model of the phenomenal properties that we take into account. The metaphor of Bayesian networks is formally spelled out and their general properties are well characterised (Jensen

\textsuperscript{8}For ‘Beliefs-Desires-Intentions’.
and Nielsen, 2007). I will mention only two of them, which are directly relevant to the topic of this paper, namely dynamism and d-separability.

A Bayesian network is a directed acyclic graph whose nodes are variables. Each variable comes with a finite domain of mutually exclusive values (often called ‘states’). For each atomic sub-network where a node \( Y \) has exactly parents \( X_1 \ldots X_n \), there is a unique conditional probability table \( \Pr(X = x | Y_1 = y_1 \ldots Y_n = y_n) \), where the values of \( X \) and \( Y_i \) range over their respective finite domains. A variable (= a node) is instantiated whenever it gets a value either by stipulation or as the result of a calculation.

A Bayesian network can be modified in at least two ways. First one can assign particular values to variables, possibly updating previous values. Second, one can change the conditional probabilities. So, a network can evolve in time.

A second property of interest is d-separation. For space reasons, I won’t present the relevant definitions but use instead an indirect route. Consider a node \( X \), its Markov blanket is defined as follows.

When the Markov blanket of \( X \) is instantiated, all the other nodes in the graph are d-separated from \( X \). This means that no influence can pass between \( X \) and a node which is not in \( MB(X) \).

We can now return to the MC/NMC problem. When a speaker uses a layered message, she makes it manifest that she believes that the effect of the message is to rise the probability that the addressee will integrate the MC of the message into her own Bayesian network. The integration of a piece of information \( \phi \) into a network \( B \) is noted \( B \odot \phi \). It consists in adjusting the network with all the equations of the form \( X = x \) entailed by \( \phi \). If \( \phi \) and \( \psi \) are not d-separated, it is possible that the probability of \( \psi \) in the new network \( B \odot \phi \) is different from its probability in the initial network \( B \).

If things go normally, a receiver who trusts the sender will adjust her network, which allows us to ignore the doxastic operators, thus simplifying the description.

What is the difference with the NMC? From an intentional point of view, it is difficult to defend the claim that the sender is not committed to the truth of the NMC in the same way as for MC. For instance, Potts (2005) argues rightly that a conventional implicature is not ‘less true’ for the speaker than the at-issue content (MC). Are the communicative intentions of the speaker different? Maybe the speaker does not intend that the addressee adjust her beliefs to integrate the NMC (Jayez and Rossari, 2004)? While it might be the case in certain dialogue situations, it is probably not a constitutive property of the NMC. For instance, in the following exchange the presupposition that Paul has been married is not necessarily ‘less important’ in any

\[ \text{I disregard the possibility that the ‘owner’ of the network modifies the probability tables. This can in fact be simulated by} \]

\[ \text{assigning finite choices of probability tables to special (meta-)nodes.} \]
sense than the MC\textsuperscript{10}.

(35) \begin{itemize}
  \item A – What is the marital situation of Paul?
  \item B – He is divorced.
\end{itemize}

Suppose that we leave open the possibility that there are two adjustments, one with the MC and the other with the NMC and they can have—at least in certain cases—an equal intentional status, what is left for constructing a distinction that would be sensitive to relevance discourse relations? When two messages are connected by a relevance discourse relation, the effects of both are presented as interdependent. More precisely, the sender of the second message makes it manifest that the probability of some piece of information in the first (second) message is different given the second (first) message than what it would be in isolation. If we assume that any adjustment must involve the MC and can, optionally, involve the NMC, we make sure that the last state of the network results from integrating the MC in all cases. The following definition excludes the case where the adjustment is limited to the NMC.

(36) Let $m$ be a message from $a$ to $b$ at a time where $b$ has a network $\mathcal{B}_b$, then:
\begin{enumerate}
  \item $\Pr(\mathcal{B}_b \uplus MC(m)|m \& Bel_b(reliable(a, MC(m)) \& sincere(a, MC(m)))) > \Pr(\mathcal{B}_b \uplus MC(m))$
  \item $\Pr(\mathcal{B}_b \uplus (NMC(m) \& MC(m)|m) \& Bel_b(reliable(a, MC(m) \& NMC(m)) \& sincere(a, MC(m) \& NMC(M(m)))) > \Pr(\mathcal{B}_b \uplus (NMC(m) \& MC(m)))$
  \item $\Pr(\mathcal{B}_b \uplus NMC(m)|m \& Bel_b(reliable(a, NMC(m)) \& sincere(a, NMC(m)))) \simeq 0$
\end{enumerate}

A relevance discourse relation affects the probabilities of the elements it conjoins via the dependency relation it conveys. A consequence discourse relation $\phi \rightarrow \psi$ makes the probability of $\psi$ raise in a network augmented with $\phi$ and $\phi \rightarrow \psi$, when compared to the probability of $\psi$ in the initial network. An opposition discourse relation $\phi \nabla \psi$ makes the probability of $\psi$ and/or $\phi$ decrease in a network augmented with $\phi$ and $\phi \nabla \psi$ and/or in a network augmented with $\psi$ and $\phi \nabla \psi$. A causal relation acts essentially as a consequence relation. In addition, the probabilistic effects are not guaranteed for propositions that contain less information that $\phi$ or $\psi$, that is for any proposition $\chi$ such that $\phi \Rightarrow \chi$ or $\psi \Rightarrow \chi$, because we need ‘relevant relevance’, as explained in section 4.

We summarise these properties in definition (37), which simply requires that the probabilities be different. One has to keep in mind that these definitions describe what is ‘normally’ (= ideally) the case.

(37) Let $m_1$ and $m_2$ be two messages such that, in the context, they can lead to an adjustment with $\phi$ and $\psi$ respectively. $R$ is a relevance discourse relation between $m_1$ and $m_2$ wrt $\phi$ and $\psi$ and a network $\mathcal{B} =_{\text{al}} R$ conveys a relation $\rho$ between propositions such that:

\[ \Pr_{\mathcal{B} \uplus \phi \& \rho(\phi, \psi)}(\psi) \neq \Pr_{\mathcal{B}}(\psi) \lor \Pr_{\mathcal{B} \uplus \phi}(\phi) \neq \Pr_{\mathcal{B} \uplus \phi \& \psi \& \rho(\phi, \psi)}(\phi) \]

In addition, no such effect obtains in the context for propositions asymmetrically entailed by $\phi$ or $\psi$.

With a relevance discourse relation, the MC is necessarily taken into account. Either the adjustment involved only the MC and this is automatically the case, or it involved also the NMC and the requirement that no informationally weaker proposition is a good candidate guarantees that both the MC and the NMC will play a role in the probabilistic effect. When a discourse relation does not manipulate relevance, nothing special is required: the relation can fetch any part of the message content that is appropriate.

\textsuperscript{10}I owe this remark to Ira Noveck.
6 Conclusion

In this paper, I have defended a view of projective phenomena that amounts to interpreting the Gricean distinction central vs. peripheral in terms of probabilistic updates. The MC must give rise to a probabilistic adjustment and is necessarily taken into account in every discourse relation that exploits such adjustments. In more intuitive terms, the MC cannot be forgotten at any stage. I did not follow a type-based approach, like the one proposed by Potts (2005) for CIs, because it would have mechanically predicted type mismatches for attachment to the NMC. Since the NMC can provide a target for attachment but does so only optionally, I had to build a different scenario. Although the present approach and the QUD theory do not exactly superpose, it is fair to say that, in most cases, the NMC cannot address the QUD alone. I explain this empirical coincidence by the fact that answers to the QUD correspond generally to relevance discourse relations. Another similarity with the QUD hypothesis is that I do not appeal to the notion of common ground. Ducrot (1972) contemplated the possibility of explaining his loi d’enchaînement by the fact that PPs were presented as true by the speaker and, accordingly, left out of the argumentative debate which is at the heart of our linguistic behaviour. Merin (2003) tried to give substance to this idea in a formal probabilistic framework. In retrospect, the fact that PPs are often common ground or easily accommodated appears to be a side-effect of their status inside the general class of NMC constructions. Being often lexical and not speaker-centered, unlike expressives for instance (Potts, 2005), the PPs are most naturally conceived as being elements of the system of shared belief (common ground) or—at least—unproblematic. A speaker who uses a highly dubious PP runs the risk of being stopped and questioned about the PP, thus losing her control over the main thread of conversation. More generally, an uncontroversial or insignificant NMC is more likely to escape discourse disruption than a highly relevant and polemical one.

References


Presuppositions, Provisos, and Probability

Daniel Lassiter
NYU Linguistics and Institute of Philosophy

1 The Proviso Problem

Theories of presupposition projection following Heim (1983) are built around the notion of satisfaction in a local context. Geurts (1996) points out that these theories predict weak conditional presuppositions like (1a) in many cases in which the actual inferences are unconditional, as in (1b). This is the Proviso Problem.

(1) If John goes to Vegas regularly, his wife will be upset.
   a. ⇔ If John goes to Vegas regularly, he has a wife.
   b. ⇔ John has a wife.

However, as Geurts (1996) and Beaver (2001) point out, genuinely conditional presuppositions do seem to arise in certain cases.

(2) If John is a diver, he’ll bring his wetsuit on vacation.
   a. ⇔ If John is a diver, he has a wetsuit.
   b. ⇔ John has a wetsuit.

The basic puzzle is to explain why (1) has the unconditional presupposition (1b), while (2) has the conditional presupposition (2a).

Satisfaction theorists have generally opted for some kind of strengthening account: effectively, the idea is that the presupposition of (1) really is (1a), but some secondary mechanism strengthens (1a) to (1b). In addition to being somewhat ad hoc, this approach suffers from a number of empirical problems noted by Geurts (1996), of which two of the most important are discussed here. First, such a theory must explain how the mechanism which strengthens the conditional presupposition in (1) can avoid doing the same in (3):

(3) Sam knows that if John goes to Vegas regularly, he has a wife.
   a. ⇔ If John goes to Vegas regularly, he has a wife.
   b. ⇔ John has a wife.

Satisfaction theories predict that the presuppositions of (1) and (3) should be the same, and yet the strengthening mechanism must be able to distinguish them. Second, the theory must explain “semi-conditional” presuppositions like (4b).

(4) If John is a diver and wants to impress his girlfriend, he’ll bring his wetsuit.
   a. ⇔ If John is a diver and wants to impress his girlfriend, he has a wetsuit.
   b. ⇔ If John is a diver, he has a wetsuit.
   c. ⇔ John has a wetsuit.
2 Overview

I will present a modified satisfaction theory built around the assumption that information states are probabilistic in form. On this account, presuppositions are not propositions, but conditions on the distribution of probabilities among possible states of the world. In many cases this approach makes the same predictions as standard satisfaction theories which treat information states as sets of worlds. However, the move to probabilities brings along a number of empirical and methodological benefits. Most importantly, this approach explains the data in (1-4) as being due to the general fact that, depending on the shape of the relevant probability distribution, “conditional” presuppositions may actually entail the corresponding “unconditional” ones. The theory predicts “unconditional” inferences when the conditional probability of consequent given antecedent is greater than or equal to the unconditional probability of the antecedent, and “conditional” inferences when the conditional probability is greater; I show that prediction fits the data well.

The present theory improves in several ways on previous accounts of the Proviso Problem, including those which invoke relevance and/or probabilistic independence. Many previous approaches invoke strengthening mechanisms which can reasonably be criticized as ad hoc and excessively powerful (e.g., Singh 2007; see Schlenker 2011 for discussion). The proposal of Schlenker (2011), while more constrained, does not contain any theoretical rationale for its occasional invocation of probabilistic independence. In contrast, my probabilistic solution to the Proviso Problem follows directly from the architecture of the theory of presupposition that I propose, rather than being invoked as a deus ex machina strengthening mechanism.1

In addition, in §5.2 I present new data showing that the account proposed here has an empirical advantage over set-theoretic accounts which invoke strengthening mechanisms triggered by probabilistic independence. “Unconditional” inferences do not arise only when antecedent and consequent are independent, but also when the conditional probability of the consequent given the antecedent is less than the unconditional probability of the consequent. This is unexpected if independence is crucial, but I show that it follows directly from the account proposed here. In the concluding section I generalize the theory slightly to account for presuppositions in the scope of a quantifier.

3 Motivation and Formal Details

Satisfaction theorists generally assume that presuppositions place conditions on the information states of conversational participants in some way. Presumably the same information states are relevant to the evaluation of epistemic modals (as claimed explicitly by e.g. Veltman 1996; Yalcin 2007). In this section I outline a recent proposal which makes this connection explicit, due to Klínedinst & Rothschild (2010), and propose a probabilistic variant which builds on recent work on the semantics of epistemic modals and on formal modeling of information states in cognitive science.

1An account built around a different non-probabilistic concept of “independence” which makes reference to a notion of orthogonality of questions is proposed by van Roonj (2007). This account and the present one are close in spirit, if not in implementation; a detailed comparison of the predictions of the two theories would be useful, but will not be pursued here for space reasons.
3.1 A Satisfaction Theory Based on Information States

Yalcin (2007) uses facts about the sentence-internal dynamics of epistemic modals to argue that interpretation is relativized to an information state parameter \( s \) which can be manipulated by various operators including attitude verbs and \( if \). Klinedinst & Rothschild (2010) adopt Yalcin’s proposal and use it to construct a static variant of dynamic approaches to presupposition projection (e.g., Heim 1983; Beaver 2001). Although the use of static semantics is not crucial to my proposal, using their account as the basis for my proposal will simplify the presentation somewhat, and I will begin by outlining the main ideas.

Following Yalcin, Klinedinst & Rothschild relativize the interpretation function \([\cdot]\) to a context \( c \), a world \( w \), and an information state \( s \). They assume that information states are sets of worlds. We can define presupposition in the spirit of their proposal as:

\[
(5) \text{Let } \phi \text{ be an atomic sentence which can be used felicitously only if all worlds in the contextually relevant information state } s \text{ satisfy some proposition } \psi. \text{ Then we say that } \phi \text{ presupposes } \psi.
\]

(From here on I adopt the convention of underlining presupposed material: so, for example, if \( \chi \) has a presupposition it will be written \( \underline{\chi} \).)

The next step is to define connectives which manipulate \( s \). The key to projection in this system is that clauses which occur later in a sentence may be evaluated with respect to a local information state which may take into account the information contained in earlier clauses. This is in contrast to the global information state with respect to which a full sentence is evaluated.

\[
(6) \text{Let } s_{\chi} = \{ w' \in s \mid [\chi]^{c,s,w'} = 1 \}, \text{ the } \chi\text{-subset of } s. \text{ Then:}
\]

a. \([\neg \phi]^{c,s,w} = 1 \text{ iff } [\phi]^{c,s,w} = 0\)

b. \([\phi \land \psi]^{c,s,w} = 1 \text{ iff } [\phi]^{c,s,w} = 1 \text{ and } [\psi]^{c,s,w} = 1\)

c. \([\phi \lor \psi]^{c,s,w} = 1 \text{ iff } [\phi]^{c,s,w} = 1 \text{ or } [\psi]^{c,s,w} = 1\)

d. \([\phi \rightarrow \psi]^{c,s,w} = 1 \text{ iff } [\phi]^{c,s,w} = 0 \text{ or } [\psi]^{c,s,w} = 1\)

The information state parameter sometimes changes depending on which clause is being evaluated, in a way which takes account of what was encountered earlier.\(^2\) Presupposition is defined for complex sentences as:

\[
(7) \text{A complex sentence } \phi \text{ presupposes that the presuppositions of all atomic parts } \psi \text{ of } \phi \text{ are fulfilled, relative to the local information state of } \psi.
\]

Essentially, the presupposition of a complex sentence is the conjunction of the presuppositions of all of its atomic constituents, relative to the local information states at which they occurred.

Klinedinst & Rothschild (2010) give a number of interesting arguments for an interaction of connectives and information states along these lines which are independent of issues around presupposition projection. They also show that their proposal is essentially a static version of Heim’s 1983 dynamic semantics supplemented by Beaver’s 2001 asymmetric treatment of \( or \), and makes equivalent predictions. For example, we predict for (2) the conditional presupposition (2b) because, following the entry for \( if \) in (6d), the presupposition of the second clause (\( John \ has \ a \ wetsuit \)) is checked with respect to a local information state.

\(^2\)For simplicity, I treat \( if \) as a material conditional. Klinedinst & Rothschild (2010) give it a more complicated restrictor analysis à la Kratzer (1986), Yalcin (2007); this is probably more accurate, but I abstract from it because the difference does not affect the results of this paper.
As a result, (6) does not carry a global presupposition that John has a wetsuit, but a local presupposition that John has a wetsuit in every s-world in which he is a diver. This is of course equivalent to the condition that, in every s-world, either John is not a diver or he has a wetsuit, which is the same as Heim’s presupposition John is a diver ⊃ John has a wetsuit. Also as with standard satisfaction theories, Klinedinst & Rothschild’s 2010 predict the same conditional presupposition for all conditional sentences.

3.2 Proposal: A Probabilistic Satisfaction Theory

It is generally assumed in linguistic semantics that the information states relevant to presupposition and epistemic modality are appropriately modeled by sets of worlds. However, recent work on epistemic modality has shown that certain phenomena involving the gradability of epistemic modals and the inferences that they license requires information states with a richer structure than sets of worlds: they must be probabilistic in form (Yalcin 2010; Lassiter 2010, 2011). If this is right, then it is reasonable to suppose that the information states relevant to presupposition projection are also probability distributions. I will argue that the Proviso Problem is one of several sets of facts which support such an analysis.

An information state s is a probability measure on a set of worlds W if and only if Φ ⊆ P(W) is a set of propositions (sets of worlds), and

a. s: Φ → [0, 1], where W ∈ Φ, and Φ is closed under union and complement;
b. s(W) = 1;
c. For all A and B ∈ Φ: if A ∩ B = ∅, then s(A ∪ B) = s(A) + s(B).

In the simplest case (when the cardinality of W is not too great), a probability measure can be thought of as a set of epistemically possible worlds supplemented by a measure function which is normalized so that it sums to 1. Technically, then, the use of probability measures is a straightforward enrichment of the set-based conception of information states, but it is also a move with considerable theoretical consequences.3

In addition to the indirect argument from the semantics of epistemic modals, we could justify the move to probabilistic information states in the theory of presupposition by appealing to work which connects presupposition projection and accommodation to defeasible and non-monotonic reasoning (Kálmán 1990; Mercer 1992; Lassiter 2009; and, less directly, Stalnaker 2002:715-719). Probabilistic models are widely considered to be the optimal formalism for non-monotonic reasoning in modern artificial intelligence and machine learning (Pearl 1988; Korb & Nicholson 2004; Bishop 2006; Russell & Norvig 2010). We might also appeal to computational and experimental results in recent cognitive science showing that probabilistic theories improve upon traditional logical and set-theoretic approaches in accounting for reasoning, learning and decision-making (see Chater et al. 2006; Griffiths et al. 2008 and references therein). However, in this paper I will focus on what the use of probabilistic representations can buy us in the theory of presupposition itself, in particular its usefulness in explaining some longstanding puzzles involving the relationship between background knowledge and the appearance of “conditional” and “unconditional” presuppositions. The proposal here derives support from, but does not rely on, arguments from other domains for the usefulness of probability in formal modeling of information states.

3This definition requires only that s be finitely additive. This is for simplicity only; enforcing countable additivity would require a slightly more complicated axiomatization, but the difference is not important for our purposes.
Suppose, then, that speakers come to a conversation equipped with probabilistic information states, and that these states are relevant to determining both the felicity of presuppositional expressions and the way in which presuppositions project. How can this be implemented formally? For simple sentences, I propose:

(9) Let \( \phi \) be an atomic sentence, and let \( \phi^0 \) be the “traditional” presupposition of \( \phi \). The \textbf{probabilistic presupposition} of \( \phi \) is:

\[ \phi \] cannot be uttered felicitously unless \( s(\phi) \), the probability of \( \phi \), meets or exceeds some high threshold \( \theta \).

On this account presuppositions are conditions on the shape of the probability measure \( s \), rather than propositions (sets of worlds) as in the usual account. However, when \( \phi \) carries the probabilistic presupposition \( s(\phi) \geq \theta \), I will also sometimes say that “\( \phi \) presupposes \( \phi^0 \)”.

(9) is not too different from Klinedinst & Rothschild’s account: for them, a presupposition is interpreted as the condition that \( \phi \) is inappropriate unless \( \phi \) is entailed by the relevant information state. (9) is a minimal modification to this idea to make use of probabilistic information: rather than being made certain (entailed) by a relevant set of worlds, \( \phi \) must be made \textbf{highly likely} to degree \( \theta \) by a relevant probability distribution.

I have left \( \theta \) as a free parameter in the model, in order to leave room for the possibility that its value is determined by reference to the conversational stakes and other features of the conversational score (cf. Lewis 1979). In addition, there is some evidence that speakers use presuppositions even when they are not completely certain that the presupposition is fulfilled, as long as it is considered very likely (e.g., K´alm´an 1990). Plausibly, this is related to Stalnaker’s 2002 claim that presupposition is more accurately characterized as an attitude of common acceptance, rather than common belief, among the parties in a conversation. However, as far as the account of the Proviso Problem that I will propose is concerned, \( \theta \) could set to the maximally strict value 1, in probabilistic imitation of the usual requirement of entailment by the relevant information state.

Finally, I adopt the definitions of the connectives from (6) wholesale. The only modification necessary is to redefine \( s_\phi \) so that it is a probability measure rather than a set of worlds. The natural way to do so is to treat it as a conditional probability measure:

\[(10) \quad s_\phi =_{df} \text{the function } s' \text{ such that, for any proposition } \psi, \quad s'(\psi) = \frac{s(\phi \land \psi)}{s(\phi)}.\]

In standard probabilistic language, \( s_\phi(\psi) \) is the conditional probability of \( \psi \) given \( \phi \), i.e. \( \text{prob}(\psi|\phi) \).

These are the only modifications that I propose to Klinedinst & Rothschild (2010): treat information states as probability measures, and substitute high probability (as in (9)) for certainty (entailment by the information state, as in (5)). Similar modifications could be made, with some technical differences, to many other satisfaction theories.

4 Key Features of the Probabilistic Account

The probabilistic satisfaction theory that I outlined in the previous section differs from standard set-theoretic approaches in a few small and well-motivated ways. Nevertheless, these slight changes have far-reaching consequences. The predictions remain close to Heim’s in simple cases, but projection depends on the details of the global information state in a much more fine-grained way than is predicted in satisfaction theories with
set-theoretic representations of information states. This feature allows us to explain the Proviso Problem without invoking extra strengthening mechanisms.

4.1 Projection and Equivalence in Simple Cases

When the initial clause of a compound sentence contains a presupposition, the presupposition of the compound sentence is predicted to be the same as it would be if that clause were asserted on its own. For example, *John’s wife is unhappy, and he will not go to Vegas* is predicted to share the presupposition of *John’s wife is unhappy*: \( s(\text{John has a wife}) \geq \theta \). This is because, by (6b), the local information state when the conjunct *John’s wife is unhappy* is evaluated is the same as the global information state. This is also the information state which would also be operative if *John’s wife is unhappy* were uttered in isolation.

Consider now the compound sentence *John has a sister, and his sister lives in France*. Abbreviate the first clause by \( \chi \). By (6b), \( \chi \) is evaluated relative to a local information state which is identical to the global information state \( s \), and the second clause is evaluated relative to the information state \( s_\chi \). By virtue of containing the DP *his sister*, the second clause presupposes that *John has a sister* has probability greater than \( \theta \) relative to its local information state \( s_\chi \); that is, the probability that John has a sister must be high relative to the local information state of the consequent in order for the sentence to be felicitous. By the hypothesis in (7) this means that the sentence *John has a sister, and his sister lives in France* is inappropriate unless

\[
s_\chi(\text{John has a sister}) \geq \theta \quad \text{or, equivalently,} \quad \frac{s(\chi \land \text{John has a sister})}{s(\chi)} \geq \theta
\]

But the latter is just an abbreviation for

\[
\frac{s(\text{John has a sister} \land \text{John has a sister})}{s(\text{John has a sister})} \geq \theta
\]

which is trivial: the left side of this inequality will always equal 1, and so the inequality holds for any value of \( \theta \). The correct prediction is that *John has a sister, and his sister lives in France* does not have any non-trivial presuppositions.

On the other hand, the sentence *John has a sister, and his brother lives in France* is predicted to presuppose that

\[
s_\chi(\text{John has a brother}) \geq \theta \quad \text{or, equivalently,} \quad \frac{s(\text{John has a sister} \land \text{John has a brother})}{s(\text{John has a sister})} \geq \theta
\]

Now this is a non-trivial presupposition: what it says is that, restricting attention to the portion of \( s \) in which *John has a sister* is true and normalizing so that that portion has measure 1, the probability that John has a brother is at least \( \theta \). In effect, this means that if we were to find out for certain that John has a sister, the probability that he has a brother would meet or exceed the threshold \( \theta \).

There is an important difference between our system and standard satisfaction theories at this point. Existing satisfaction theories assume that presuppositions are the same sort of thing as sentence meanings, i.e. propositions: for instance, the sentence *John has a sister, and his brother lives in France* presupposes

\footnote{Unless \( s(\chi) = 0 \), in which case \( s_\chi \) is undefined; this does not affect the point here.}
the proposition \textit{John has a sister} $\rightarrow$ \textit{John has a brother}. In our system, in contrast, the presupposition is not a proposition but a constraint on the shape of the local probabilistic information state which also puts constraints on (part of) the global probability distribution $s$. In many cases these constraints cannot be accurately paraphrased by saying “Sentence $S$ presupposes sentence $S'$”; the precise presuppositions have the probabilistic form we have seen, and detailed facts about the shape of the relevant probability measure will determine which paraphrases of our probabilistic presuppositions are appropriate in a given context.

4.2 Independence

There are three possible relationships between $s(\psi)$ and $s_\phi(\psi)$: either $s(\psi) = s_\phi(\psi)$, $s(\psi) > s_\phi(\psi)$, or $s(\psi) < s_\phi(\psi)$. As we will see later, which of these is instantiated determines whether a local constraint on the information state is stronger, weaker, or equivalent to the same constraint placed on the global information state, and thereby influences which paraphrases of the presupposition are appropriate. A particularly important probabilistic relationship is the case in which $\phi$ and $\psi$ are independent.

Let $\phi = \textit{John has a sister}$ and $\psi = \textit{John has a brother}$. Suppose that we don’t know anything at all about John, and we are in a society in which the (unconditional) probability of someone’s having a brother is the same as the probability of his having a brother given that he has a sister. In this case, the proposition that John has a brother is probabilistically independent of the proposition that he has a sister:

\[ s(\psi) \geq \theta \]

Equivalent formulations of (11) are $s(\phi) = s_\psi(\phi)$ and $s(\phi \land \psi) = s(\phi) \times s(\psi)$.

Intuitively, two propositions are independent just in case finding out the truth-value of one would not give you any information about the probability that the other is true. In the brother-sister example, this means that knowing that John has a sister does not make \textit{John has a brother} either more or less likely: this proposition receives the same portion of the total probability in $W$ that it does of the probability in the subset of $W$ in which \textit{John has a sister} holds.

5 The Proviso Problem Explained

5.1 The Basic Problem

The formal apparatus in §3 and the notion of independence give us everything we need to explain the core data surrounding the Proviso Problem. The basic problem that we began with was the contrast between (1) and (2): why do conditionals sometimes give rise to presuppositions that are well-paraphrased by conditional sentences, and sometimes not?

\[ \text{(12)} \text{ If John goes to Vegas regularly, his wife will be upset.} \]
\[ \text{a. } \rightarrow \text{ If John goes to Vegas regularly, he has a wife.} \]
\[ \text{b. } \not\rightarrow \text{ John has a wife.} \]

Technically, the present theory does not predict either of the presuppositions in (12); but it does predict a probabilistic presupposition of the form:

\[ \frac{s(\text{John goes to Vegas regularly} \land \text{John has a wife})}{s(\text{John goes to Vegas regularly})} \geq \theta \]
If it happens that John’s having a wife is probabilistically independent of his going to Vegas regularly — a plausible assumption in our current state of ignorance — then, by the definition of probabilistic independence, this condition is equivalent to

\[ s(John \ has \ a \ wife) \geq \theta \]

This is the same presupposition that an utterance of the simple sentence *John’s wife is upset* would have.

As this example illustrates, if presuppositions are probabilistic as I have proposed, then a sentence of the form *If φ then ψ* is predicted to the same presupposition as ψ alone whenever they are evaluated relative to an information state in which the antecedent and the presupposition of the consequent are probabilistically independent. This captures, as nearly as possible in the present theory, the claim that (12) presupposes (12b): independence of antecedent and consequent leads to “unconditional” presuppositions without further ado.

The next obvious question is why (12) does not presuppose (12a). Naturally, in my proposal, presuppositions never have the form of a conditional statement like (12a), even though probabilistic presuppositions may sometimes be approximated by certain conditional sentences; so the question to ask is why (12a) does not serve as a good paraphrase of the probabilistic presupposition of (12). It is not too hard to see why (12a) is not a good paraphrase here, though: the conditional sentence in (12a), for extraneous reasons involving the pragmatics of natural language conditionals, licenses an inference that there is a relevant connection between the question whether John goes to Vegas regularly and the question whether he has a wife. This is exactly contrary to our assumption of independence. As a result, in situations in which the assumption of independence is satisfied, conditional sentences are expected to be a bad paraphrase of the probabilistic presupposition, and unconditional sentences are left as the only decent renditions.

### 5.2 “Unconditional” Inferences Without Independence

Schlenker (2011), following unpublished work by Raj Singh, suggests an explanation of the Proviso Problem which was a source of inspiration for the present account. He also makes use of probabilistic independence, although the account is presented as a fairly stipulative addition to an otherwise set-theoretic account of presupposition. In addition to the theoretical advantage of deriving the independence condition directly, the account given here derives support from the fact that it correctly predicts unconditional inferences in a broader class of cases, including ones in which independence does not hold.

Let \( ψ \) be the consequent of a conditional, with presupposition \( ψ \). If \( ψ \) is not probabilistically independent of the antecedent \( φ \), then there are two possibilities: either \( s_φ(ψ) < s(ψ) \) or \( s_φ(ψ) > s(ψ) \). We consider the first case in this subsection, and return to the second in the next. For a relevant example, consider (13).

(13)  If Sam is begging in the streets, he ought to sell his mansion.
   a. \( \therefore \) If Sam is begging in the streets, he has a mansion.
   b. \( \therefore \) Sam has a mansion.

It seems unlikely that \( φ \) and \( ψ \) are independent here: instead, the probability that Sam has a mansion is presumably much reduced if we assume that he is a beggar, and so \( s_φ(ψ) < s(ψ) \). Nevertheless, the most natural paraphrase of the presupposition of (13) is (13b). A similar example is (14), which carries the “unconditional” presupposition (14b) even though the antecedent and the presupposition of the consequent are almost certainly not independent.

(14)  If the grass has not been mowed in months, Bill’s full-time gardener will do it next week.
a. \(\sim \) If the grass has not been mowed in months, Bill has a full-time gardener.

b. \(\sim\) Bill has a full-time gardener.

This example is problematic for a theory which relies on a strengthening mechanism triggered by probabilistic independence, since the mechanism should not be operative in this case. However, on the present theory we have an immediate explanation: the fact that (13b), rather than (13a), is the primary inference that is drawn here can be attributed to the fact that (15a) and (15b) together entail (15c).

\[
\begin{align*}
(15) & \quad a. \quad s_\phi(\psi) < s(\psi) \\
& \quad b. \quad s_\phi(\psi) \geq \theta \\
& \quad c. \quad \therefore s(\psi) \geq \theta
\end{align*}
\]

(15c) is the same presupposition that the simple sentences *Sam ought to sell his mansion* and *Bill’s full-time gardener will mow the grass next week* would give rise to. As long as we are in an information state in which \(s_\phi(\psi) < s(\psi)\), the conditions placed on \(s\) by the presuppositions of (13) and (14) are well-paraphrased by unconditional sentences. We expect “unconditional” inferences not just in case of independence, but whenever the global probability \(s(\psi)\) is equal to or greater than the local probability \(s_\phi(\psi)\).

As before, we also need an account of why (13a) is not a good paraphrase of the presupposition of (13). This time there is a relevant connection between the antecedent and the consequent of (13a), but it goes the wrong way. In most contexts, the paraphrases in (13a) and (14a) will lead to a conditional perfection inference: that is, the conditional paraphrase will generate the undesired inference that, if the grass *has been mowed recently* then Bill does *not* have a gardener, much as (16a) implicates (16b).

\[
\begin{align*}
(16) & \quad a. \quad \text{If you mow the lawn, I’ll give you $5.} \\
& \quad b. \quad \text{If you don’t mow the lawn, I won’t give you $5.}
\end{align*}
\]

Nothing like this inference is associated with the probabilistic presupposition \(s_\phi(\psi) > \theta\). The attempted paraphrase in terms of a conditional sentence again fails because it introduces additional inferences which are not appropriate; the best paraphrase of the probabilistic presupposition is the unconditional (16b).

### 5.3 Genuine Conditional Inferences

The second possibility when \(\phi\) and \(\psi\) are not independent is that \(s_\phi(\psi) > s(\psi)\). These are the clear cases of conditional inferences like (2), repeated here.

\[
\begin{align*}
(17) & \quad \text{If John is a diver, he’ll bring his wetsuit on vacation.} \\
& \quad a. \quad \sim \text{If John is a diver, he has a wetsuit.} \\
& \quad b. \quad \sim \text{John has a wetsuit.}
\end{align*}
\]

My proposal predicts the presupposition \(s_\phi(\psi) \geq \theta\) where \(\phi = \text{John is a diver}\) and \(\psi = \text{John has a wetsuit}\). Since divers are in general more likely than ordinary people to own wetsuits, if we have no other information about John, the probability that he has a wetsuit is substantially lower than the probability that he has a wetsuit on the assumption that he is a diver. As a result, the “conditional” presupposition does not entail the “unconditional” one: from \(s_\phi(\psi) \geq \theta\) and \(s(\psi) < s_\phi(\psi)\) we cannot infer anything about whether \(s(\psi) \geq \theta\) or not. For this reason the presupposition that \(s(\psi) \geq \theta\) – the one paraphrased by “John has a wetsuit” – is not entailed in this context.
On the other hand, the presupposition $s_\phi(\psi) \geq \theta$ is appropriately paraphrased by the conditional sentence “If John is a diver, he has a wetsuit” in this case. Neither of the extra inferences that attach to the conditional paraphrase — the relevance inference and conditional perfection — is problematic here: whether or not John is a diver is clearly relevant to the question of whether he has a wetsuit, and the (weak) secondary inference that he does not have a wetsuit if he is not a diver is not inappropriate. As a result, (17a) “feels” like the right presupposition — it is close enough, although technically it is not what is presupposed.

The main predictions of this account are these. First, when satisfaction theories predict presuppositions that have the form of conditionals, “unconditional presuppositions” will arise when the probability of the presupposed material relative to its local information state is less than or equal to the probability of the same material relative to the global information state. Second, “conditional presuppositions” will arise when the probability of presupposed material relative to its local information state is greater than the global probability of the same material. In my survey of the literature, the clear examples of both of these types of presuppositions fit this characterization well. Furthermore, we expect to find a certain amount of disagreement among scholars about certain cases, simply because they may be coming to the discussion with different background assumptions which affects their judgments of probabilistic dependence in the crucial scenarios (cf. van Rooij 2007, p.298).

5.4 Two Types of “Conditional” Presuppositions

As we saw in §1, a problems for any account of the Proviso Problem based on strengthening is to explain why the mechanism which strengthens the presupposition of (1)/(12) (If John goes to Vegas regularly, his wife will be upset) does not also apply to (3), repeated here.

(18) Sam knows that if John goes to Vegas regularly, he has a wife.
   a. If John goes to Vegas regularly, he has a wife.
   b. # John has a wife.

It should be clear from the foregoing what the answer will be: (1/12) simply does not have the same presupposition as (3/18). The “conditional presupposition” of (12) is a conditional probability statement $s_\phi(\psi) \geq \theta$. (18), on the other hand, presupposes that the probability of a conditional statement — namely (18a) — is at least $\theta$. Unless we make the further assumption that $s_\phi(\psi) = s(\text{if } \phi \text{ then } \psi)$ — i.e., that the probability of a conditional is the same as the corresponding conditional probability statement — then no problem arises.

In fact, although this equation is very intuitive, there is good reason to doubt that it holds in general. Lewis (1976) proved, using very weak assumptions about the semantics of conditionals, that no non-trivial probability measure can systematically equate probabilities of conditionals with conditional probabilities. This result has been examined and expanded by many others, see especially Hájek & Hall (1994). Even though there is no generally agreed-upon answer as to how the probability of a conditional sentence is determined — and I do not have an answer to offer here — the fact that this equation does not hold means that our theory defuses Geurts’ objection to satisfaction theories, which was based on the fact that (1)/(12) and (3)/(18) have previously been assumed to carry the same presupposition.
5.5 Semi-Conditional Presuppositions

Why does (19) (repeated from 4) presuppose something that can be paraphrased as (19b) rather than (19a) or (19c)?

(19) If John is a diver and wants to impress his girlfriend, he’ll bring his wetsuit on vacation.
   a. # If John is a diver and wants to impress his girlfriend, he has a wetsuit.
   b. If John is a diver, he has a wetsuit.
   c. # John has a wetsuit.

This result follows straightforwardly from the previous discussion and a few plausible assumptions about the probability measure $s$. Let $\phi = \text{John is a diver}$, $\psi = \text{John wants to impress his girlfriend}$, and $\chi = \text{John has a wetsuit}$. The presupposition is:

$$s_{(\phi \land \psi)}(\chi) \geq \theta \quad \text{or, equivalently,} \quad \frac{s_{(\phi \land \psi \land \chi)}}{s_{(\phi \land \psi)}} \geq \theta$$

The example in (19) gets its force from the fact that $\phi$ and $\psi$ are probabilistically independent: whether John is a diver has no bearing on whether he wants to impress his girlfriend. Furthermore, although $\phi$ and $\chi$ are not independent, they are surely jointly independent of $\psi$: John’s wetsuit ownership may well depend on his being a diver, but these two events have nothing to do with his relationship with his girlfriend. Formally,

$$\frac{s_{(\phi \land \psi \land \chi)}}{s_{(\psi)}} = s_{(\phi \land \chi)} \quad \text{or equivalently,} \quad s_{(\phi \land \psi \land \chi)} = s_{(\phi \land \chi)} \times s_{(\psi)}$$

If $\phi$ and $\psi$ are independent and the joint independence condition is fulfilled, the probabilistic presupposition of (19) is equivalent to

$$\frac{s_{(\phi \land \chi)} \times s_{(\psi)}}{s_{(\phi)}} \geq \theta$$

Canceling $s_{(\psi)}$ gives us (20):

(20) $s_{\phi}(\chi) \geq \theta$

(20) is, of course, the same presupposition that we attributed to If John is a diver, he will bring his wetsuit on vacation in (17); and, for the same reasons, it is well-paraphrased by (19b). In short: as long as the assumption of joint independence is appropriate for a particular example of this type, semi-conditional presuppositions are what we expect.

6 Probabilistic Presuppositions for Quantified Sentences

An apparent problem with the account given here is that probabilities are defined for propositions only, but presuppositions attach to objects of propositional and predicative type alike.

(21) Has each of these ten students stopped smoking?
    a. $\sim$ Each of these ten students used to smoke.
(21) seems to presuppose something like (21a). Interestingly, the universal inference is not due to the quantifier each: few and none have essentially the same effect (although the judgment in (22a) is disputed, cf. Chemla (2009)).

(22) Have few of these ten students stopped smoking?
   a. ~ Each of these ten students used to smoke.

(23) Have none of these ten students stopped smoking?
   a. ~ Each of these ten students used to smoke.

This is pressing because the Proviso Problem arises with quantified statements (Schlenker, 2011):

(24) If I take my friends diving, few of them will enjoy seeing the corals.
   a. ~ If I take my friends diving, all of them will see the corals.
   b. ~ All of my friends will see the corals.

(25) If I grade their homeworks, few of my students will realize that they are incompetent.
   a. ~ If I grade their homeworks, all of my students are incompetent.
   b. ~ All of my students are incompetent.

In principle we should be able to extend the account of the Proviso Problem given here to explain the contrast between (24) and (25). However, we cannot do so until we know how to assign probabilities to open sentences such as x is incompetent.

To do so, we have to re-interpret the probabilistic apparatus as involving not just the probability of events but the more general concept of expected value, denoted \( E(-) \). The expectation of a proposition is just its probability: For any \( \phi \), \( E(\phi) = s(\phi) \). The truth-value of an open sentence is a Bernoulli random variable, one whose outcome is always 1 (true) or 0 (false). Its expected value is the probability that it will be given arguments which makes the sentence true. In the most straightforward case, this corresponds to the fraction of individuals in the domain who satisfy the open sentence.

To illustrate the concept of expectation, consider the expected value of a single roll of a fair die. The value of this roll is given by a function \( X = \lambda x. val(x) \), where \( val \) is a function which assigns to each side of the die the number of dots on it. This function has as its range \( \{1, 2, 3, 4, 5, 6\} \), and since the die is fair it takes each value with equal probability, \( \frac{1}{6} \). We calculate the expectation \( E(\lambda x. val(x)) \) by finding the sum, for possible outcome \( x \), of the value of \( x \) (the number of dots that come up) multiplied by the probability that the outcome of the trial will be \( x \).

\[
E(X) = \sum_{x} [val(x) \times \text{prob}(X = x)] = 1 \times \frac{1}{6} + 2 \times \frac{1}{6} + 3 \times \frac{1}{6} + 4 \times \frac{1}{6} + 5 \times \frac{1}{6} + 6 \times \frac{1}{6} = 3.5
\]

Notice that the expected value of a single roll of a fair die is 3.5, a value which cannot be the actual outcome of the trial.

In a similar fashion, an open sentence like x is incompetent can be treated as a Bernoulli random variable \( Y = \lambda y. \text{incompetent}'(y) \). The value of this variable for any particular x is 1 if the chosen individual is incompetent, and 0 otherwise. The expected value of \( Y \) is the probability of a “successful trial”, that is, a “yes” answer to the question “Is x incompetent?” for x chosen from the domain of quantification \( D \) with some specified probability distribution.
If the probability distribution is maximally uninformative, i.e. that our choice of a test individual for the presupposition is random, then (26) is equivalent to

$$E(\lambda y. incompetent'(y)) = \sum_{z \in D} ([\lambda y. incompetent'(y)](z) \times prob(Y = z))$$

That is, the expected value of the open sentence $\lambda x. incompetent'(x)$ is the fraction of individuals in the domain of quantification who are incompetent.

The last step is to revise the definition of presupposition so that the expectation of a presupposition must be $\geq \theta$ and to extend conditional probability to conditional expectation in the obvious way. The predicted presupposition for (24) is:

$$\frac{E(I\ take\ my\ friends\ diving \land x \in D\ sees\ the\ corals)}{E(I\ take\ my\ friends\ diving)} \geq \theta$$

If $D = [my\ friends]^{c,s,w}$ and $prob(\cdot)$ is flat, this presupposition can be paraphrased as “Assuming we go diving, almost all of my friends will see the corals”. This presupposition is slightly weaker than the presupposition that each of my friends will see the corals, which is what we initially assumed, but not implausible.

For reasons now familiar, this presupposition will lead to the “unconditional” inference paraphrased by Almost all of my friends will see the corals only if the unconditional expectation (the fraction of my friends who will see the corals no matter what) is at least as great as the conditional expectation (the fraction who will do so if I take them diving). Since this condition is obviously not fulfilled here, the presupposition of (24) is best paraphrased by the conditional sentence (24a). However, when the conditional and unconditional expectations are equal we expect inferences that are naturally paraphrased by sentences without conditionals. This accounts for (25), since my students’ competence is presumably unrelated to my decision about whether or not to grade their homework.

As long as $prob(\cdot)$ is held constant across quantifiers, this approach predicts the same presupposition for all sentences with presuppositions in the scope of a quantifier, like Heim (1983) and Schlenker (2009). Experimental results of Chemla (2009) suggest that this prediction may be incorrect, although the matter is still under investigation. Note, however, that the current account is flexible in this regard: there is no reason to assume that the probability function used to calculate expectation must always be flat. For example, Chemla finds that the inference that all entities in the domain have the relevant property is much less robust with numerical quantifiers such as less than/more than/exactly three than it is with each and no. It may be that the use of a numerical quantifier influences the appropriate probability distribution in a way that gives greater weight to individuals who satisfy the restriction of the quantifier, with the result that the expected value of the relevant property can be $\geq \theta$ even if the proportion of individuals with the property is less than $\theta$.

7 Conclusion

The Proviso Problem has been taken to be a serious challenge to satisfaction theories of presupposition. In response satisfaction theorists have proposed a number of additional mechanisms in order to account for the
apparent fact that conditional presuppositions only arise when the antecedent is relevant to the consequent, and unconditional presuppositions arise otherwise. However, these mechanisms have often been stipulative, and the fact that DRT predicts a preference for global accommodation of presuppositions on independent grounds has been seen as an important point in its favor, as Geurts (1996) argues.

A probabilistic account of presupposition of the type proposed here remains close conceptually to satisfaction theories, but predicts the core phenomena of the Proviso Problem in (1-4) without adding any \textit{ad hoc} machinery. The main insight is that if presuppositions are conditions on probabilistic information states, then conditional and unconditional presuppositions end up being equivalent when the antecedent is not informative about the probability of the consequent. That is, if antecedent and consequent are probabilistically independent, the local presupposition of the consequent places the same constraint on the global information state that it would if it constrained the global information state directly. This generalizes readily to semi-conditional presuppositions like (4).

Furthermore, this approach makes the novel empirical prediction that “unconditional” presuppositions should arise, not only when antecedent and consequent are probabilistically independent, but also when the consequent is less likely given the antecedent than it would be in the global information state. Judging by (13) and (14), this prediction appears to be correct. This data is problematic for satisfaction theories which rely on a strengthening mechanism triggered by independence/irrelevance, since in these cases the antecedent is relevant to the consequent and the mechanism is not expected to take effect.

Finally, although presuppositions of quantified sentences cannot be identified with constraints on probability distributions directly, they can be integrated into this framework by treating open sentences as random variables and presuppositions as conditions on expected values.

\textbf{References}


How Evaluative Adverbs Project and Why*

Mingya Liu
University of Göttingen

Abstract
Simons et al. (2011) define a new category of ‘projective meanings’, which include not just conventional presupposition (CPs) but also certain conventional implicatures (CIs). In this paper, I discuss whether evaluative adverbs (eADVs), a subclass of Potts’ (2005) CIs, project. Liu (in preparation) addresses the necessity of distinguishing two different eADVs: factive eADVs have a lexical semantics and trigger a CI as predicted in Potts (2005), but their CI content presupposes the at-issue content, i.e. there is an interdimensional dependence, which poses a problem for a four-valued CI logic; nonfactive eADVs have a conditional semantics and trigger a CI, which differs from that predicted in Potts (2005) but is independent of the at-issue content. I argue that this distinction predicts correctly their projection behaviors: due to the interdimensional dependence, factive eADVs are not embeddable in entailment-cancelling contexts, whereas nonfactive eADVs can appear for instance in a conditional and project out of it due to the interdimensional independence. I compare this case with the case of supplements that sometimes fail to project (Schlenker 2010a, 2010b): the former imposes a semantic constraint and the latter a semantic/pragmatic constraint on what projects.

Keywords: undefinedness, interdimensional relations, embeddability, projection

1 Introduction
Simons et al. (2011) define a new category of ‘projective meanings’, which include not just conventional presupposition (CPs1) but also certain conventional implicatures (CIs).

(1) Projective Meaning (Simons et al. 2011)

*I would like to thank Regine Eckardt and Manfred Sailer for previous discussions and the audience at Tübingen and at MOSS (Moscow Syntax and Semantics) 2 for helpful comments. All errors are mine of course.

1Potts (2005) distinguishes CPs from conversational presuppositions in that conversational presuppositions may be lexically triggered but their generation needs extra-linguistic support, as in the following example.

(i) Peter divorced his wife before she died.
Conversationally-triggered presupposition: Peter’s wife died.
a. Definition of projection:
   “An implication projects if and only if it survives as an utterance implication when the expression that triggers the implication occurs under the syntactic scope of an entailment-cancelling operator.”

b. Hypotheses about what projects and why:
   “a. All and only those implications of (embedded) sentences which are not-at-issue relative to the Question Under Discussion in the context have the potential to project.
   b. Operators (modals, negation, etc.) target at-issue content.”

In this paper, I discuss whether evaluative adverbs (eADVs), a subclass of CIs, also trigger projective meanings and why or why not. Section 2 briefly reports Liu (in preparation), which discusses one problem of Potts’ (2005) CI analysis of eADVs, namely, his claim that CIs are logically and compositionally independent of at-issue content does not hold in general. The CI content that eADVs trigger is not always independent of the at-issue content. Rather, we need distinguish two kinds of eADVs: factive eADVs trigger a CI content that presupposes the at-issue content that it is related to and thus demonstrate a case where the CI and at-issue contents have an interdependence relation. This results in a three-valued logic rather than a four-valued logic. In contrast, nonfactive eADVs have a conditional semantics and trigger a CI content different from what Potts (2005) predicts. But their CI is independent of the at-issue content, thus, in this case, Potts’ four-valued logic applies. In Section 3, I show that the difference in logic between factive/nonfactive eADVs due to their distinct lexical semantics predicts correctly whether or how they project: factive eADVs are not embeddable in entailment cancelling contexts as their CI presupposes the at-issue content whereas in those contexts the at-issue content would not be true; nonfactive eADVs have the potential to project, as their CI content is independent of at-issue content. I conclude that only those implications of (embedded) sentences which are independent of at-issue content in terms of truth values can project, as a further constraint on Simons et al.’s (2011) hypotheses on what projects and why. In Section 4, I extend the discussion to the case of supplements that have the potential to project but fail to do so. This provides another argument to impose further semantic/pragmatic contraints on projective meanings. The last section summarizes the paper.

2 Factive and Nonfactive Evaluative Adverbs

eADVs are used to express an emotion or evaluation towards the propositional content of the sentence to which they are attached. In English, they can appear at the initial, the auxiliary or the final position (Jackendoff 1972). They are intonationally marked with pause and separated from the rest of a sentence by a comma in written English (Potts 2005). In German, they can appear at the Vorfeld or the Mittelfeld or the Nachfeld. Only at the last position, a comma is used in written form.

(2) English:
   a. Sadly, Michael Jackson died.
   b. Michael Jackson, sadly, died.
c. Michael Jackson died, sadly.

(3) German:

a. 1858 wurde tragischerweise der letzte Kaplöwe getötet.
   "In 1858, the last Cape Lion was, tragically, killed."

b. Tragischerweise wurde 1858 der letzte Kaplöwe getötet.

c. 1858 wurde der letzte Kaplöwe getötet, tragischerweise.

Following Karttunen and Peters (1979) and Bach (1999), Potts (2005) deliberately flouts the ‘One Sentence, One Proposition’ dogma and launches a formal treatment of CIs in his two-dimensional type-logical system. Potts argues that CIs contribute truth conditional contents - compositionally - to a sentence. He shows that the semantics of CI triggers can be computed recursively with the rest of the sentence, in his terms, deriving a CI content parallel to an at-issue content, both being entailments of the sentence. A sentence with an at-issue content and a CI content has a paired truth value, which is $<1,1>$ if both contents are true.

In English, eADVs have the semantic type $<s^a,t^a>,<s^a,t^c>$, i.e. a function taking an at-issue proposition to an at-issue proposition (henceforth, $<t^a,t^a>$ to simplify). The COMMA feature is a type shifter that takes something of an at-issue type to a CI type. The eADV sadly in the following sentence triggers a CI that it is sad that Michael Jackson died. The semantic composition and parsetree for the sentence are shown below.

(4) 

\[
[(\text{Sadly, Michael Jackson died.})]^{u,g} = <1,1> \iff p^a(w) = q^c(w) = 1.
\]

a. at-issue content ($p^a$): Michael Jackson died.

b. CI ($q^c$): It is sad that Michael Jackson died.

\[
\begin{array}{c}
\text{M.J. died: } t^a \\
\bullet \\
\text{COMMA(sadly)(M.J. died): } t^c
\end{array}
\]

\[
\begin{array}{c}
\text{COMMA(sadly): } <t^a,t^c> \\
\text{M.J. died: } t^a
\end{array}
\]

\[
\begin{array}{c}
\text{COMMA: } <<t^a,t^a>,<t^a,t^c>> \\
\text{sadly: } <t^a,t^a>
\end{array}
\]

Similarly, tragischerweise ‘tragically’ in (3) triggers a CI that it is tragic that the last Cape Lion was killed in 1858. Though, I take German eADVs to have the semantic type of $<t^a,t^c>$, and thus do not use the COMMA feature.

The CI analysis of eADVs attempts to explain the semantic duality and asymmetry of sentences with them both conceptually and formally. However, its logic is, unfortunately, flawed. There is an interdependence relation between the at-issue and the CI contents in the case of factive eADVs. Due to this, we need
an ad-hoc revision of Potts’ (2005) four-valued logic for eADVs.

2.1 Interdimensional Relations

When a sentence has multidimensional meanings of for example, presuppositions, at-issue contents, CI contents, intonational meanings, a question arises how two different dimensions interact with each other. At-issue contents and their presuppositions interact in such a way that the former is undefined if the latter is false while the truth/falsity of the latter is independent of the former. Liu (in preparation) extends a classic trivalent logic of presuppositions to a trivalent but paired-valued system. A sentence with an at-issue content and a CP has a paired truth value like a sentence with an at-issue content and a CI, but they differ in the available pairs that result in. For example, the sentence below has a different semantic composition than one with the eADV counterpart in (4), as is indicated: the superscript $v$ is used to indicate a presupposition. It has the value $<\star,0>$ when the CP is true and (consequently) the at-issue content is undefined.

(5) It is sad that Michael Jackson died.

a. at-issue content ($p^a$): It is sad that Michael Jackson died.

b. CP ($r^v$): Michael Jackson died.

CIs in Potts (2005) are so defined that they are logically and compositionally independent of at-issue content, therefore, any sentence with an at-issue content and a CI content denotes a pair of truth values, which makes a four-valued system. In addition, CIs can have their presuppositions as well. The interaction between a CI and its CP is the same as between an at-issue content and its CP. Compare:

- CPs are logically and compositionally independent of at-issue contents; an at-issue content is undefined if its CP is false.

(6) \[ L_{CP} (\text{trivalent, paired values, two-dimensional}): \]
\[ [[S]] =< [[p^a]], [[r^v]] > \in \{ <1,1>, <0,1>, <\star,0> \} \]

- CIs are logically and compositionally independent of at-issue contents. (Potts 2005)

(7) \[ L_{CI} (\text{four-valued, paired values, two-dimensional}): \]
\[ [[S]] =< [[p^a]], [[q^c]] > \in \{ <1,1>, <1,0>, <0,1>, <0,0> \} \]

- CPs are logically and compositionally independent of CI contents; a CI content is undefined if its CP is false.

(8) \[ [[CIofS]] =< [[q^c]], [[r^v]] > \in \{ <1,1>, <0,1>, <\star,0> \} \]

What is curious at this point is how CPs behave more generally. It seems necessary to distinguish the CP of a CI content from that of an at-issue content. In most of the CI triggering expressions that Potts (2005)
discusses, they are logically and compositionally independent of the at-issue contents. In those cases, it should follow that the CPs of the two dimensions are also logically independent of each other. Therefore, what we want to have in a three-dimensional logic of CPs/CIs $L_{CP/CI}$ is probably not a separate dimension of CPs, but a subdimension of CPs within the dimension of at-issue contents or the dimension of CI contents, which roughly looks like in (9-a). Or alternatively, we need a mechanism that switches the CP of a CI content from a CP type to a CI-CP type (indicated with the $vc$ superscript) in the CI application, as illustrated in (9-b). This would yield a four-dimensional logic, with at-issue-CP and CI-CP as two separate dimensions.

(9) CI application (with CPs)

a. $\beta : \sigma^a \gg \gamma : \tau^v$

   $\bullet$

   $\alpha(\beta) : \tau^c \gg \delta : \tau^v$

   $\alpha :< \sigma^a, \tau^c > \gg \gamma : \tau^v$

b. $\beta : \sigma^a \gg \gamma : \tau^v$

   $\bullet$

   $\alpha(\beta) : \tau^c \gg \delta : \tau^{vc}$

   $\alpha :< \sigma^a, \tau^c > \gg \gamma : \tau^v$

   $\beta : \sigma^a \gg \delta : \tau^v$

In the following, I will discuss the special case of eADVs, in which the interdimensional relation between a CI content and its CP content can lead to an interdependence relation between the CI content and the at-issue content of a sentence.

2.2 Lexical Semantics of Factive/Nonfactive eADVs

eADVs are usually taken as factive predicates. Since factive predicates are presupposition triggers, this means, for example, sadly, just as sad, presupposes the truth of the state of affairs described by the rest of the sentence. However, this idea is problematic for two reasons. One, we cannot apply the presupposition/assertion distinction for sentences with eADVs e.g. (2), because this ‘presupposition’ is not the presupposition but the assertion or the at-issue content of the sentence. This is not a problem if we treat this presupposition as the CP of the CI, which as I have argued above, is independent of the at-issue and its CP dimensions. However, eADVs make a special case, as the presupposition of the CI content happens to be the same as the at-issue content, as shown below:

(10) Sadly, Michael Jackson died.

   a. at-issue content ($p^a$): Michael Jackson died.

   b. (i) CI ($q^c$): It is sad that Michael Jackson died.

   (ii) Presupposition of the CI ($r^{vc}$): Michael Jackson died.
While Potts’ $L_{CI}$ is a four-valued multidimensional system, I extend a three-valued logic for CPs in (6) for them, though, with the at-issue and CI dimensions kept untouched, as in (11). This is derived, because $r^{vc} = p^a$ and thus, the dependence relation between $q^c$ and $r^{vc}$ exists also between $q^c$ and $p^a$. The third value arises when the CI content is undefined, i.e. when its presupposition (= the at-issue content) is false.

$$[[S]] = <[[p^a]], [[q^c]]> \in \{<1,1>, <1,0>, <0,1>, <0,*>\}$$

However, this trivalent logic is only needed for a subclass of eADVs, namely factive eADVs. This is related to the second problem with the claim above that ‘sentences with eADVs have a CI content that presupposes the truth of the state of affairs described by the rest of the sentence’. The CI content that an eADV triggers does not always have such a presupposition. Otherwise, all eADVs wouldn’t be able to be embedded in entailment-cancelling contexts, i.e. contexts where the presupposition of the CI content is not satisfied. In fact, some eADVs trigger a CI content that is independent of at-issue content and thus a sentence with such an eADV does yield a four-valued logic as in Potts (2005). However, the CI content that they trigger is different from one that Potts’ $L_{CI}$ predicts. English eADVs including sadly, as far as I know, all belong to this kind (Seth Cable, p.c.)\(^2\). They are nonfactive, in the sense that the CI content they trigger does not presuppose the at-issue content. German, in comparison, has both factive and nonfactive eADVs. The best examples that I came up with are leider and ungüldlicherweise. They have almost the same meaning of ‘unfortunately’, but their distribution suggests rather that they have different lexical semantics.

I propose that nonfactive eADVs have a conditional lexical semantics\(^3\). The CI content that they trigger, thus, differs from that proposed in Potts (2005). In contrast, factive eADVs have the lexical semantics as proposed in Potts (2005) and trigger a CI content as in his $L_{CI}$.

(12) **Lexical semantics of eADVs**

a. nonfactive eADVs:
   i. $[[\text{ungüldlicherweise}]] = \lambda p. p \rightarrow \text{ungüldlich}(p) : <t^a, t^c >$
   ii. $[[S]] = <[[p^a]], [[q^c]]> \in \{<1,1>, <1,0>, <0,1>, <0,1>\}$

b. factive eADVs
   i. $[[\text{leider}]] = \lambda p. \text{ungüldlich}(p) : <t^a, t^c >$
   ii. $[[S]] = <[[p^a]], [[q^c]]> \in \{<1,1>, <1,0>, <0,1>, <0,*>\}$

Potts’ (2005) four-valued $L_{CI}$ works for nonfactive eADVs. A trivalent logic obtains in the case of factive eADVs as their CIs presuppose the at-issue content. While Potts claims “Both $<1,0>$ and $<0,0>$ are the bane of a multidimensional theory of presuppositions” (2005) due to the interdependence between assertion and presupposition, as a crucial argument to draw lines between presuppositions and CIs, the two values seem to be also the bane of a multidimensional theory of certain CIs. In other words, there is sometimes an interdimensional dependence (even indirectly) between an at-issue content and a CI content.

\(^2\)I have to admit that a careful search for data is still to be done. That is, there might be eADVs in English that behave differently, which I am simply not aware of.

\(^3\)A conditional lexical semantics is also proposed by Bonami and Godard (2008) for French eADVs, but for reasons quite different from in the current study.
I will show now that the dependence relation between the CI and the at-issue content in the case of factive eADVs and the independence relation between the CI content and the at-issue content in the case of nonfactive eADVs can predict correctly their projection.

3 The Projection Problem of Evaluative Adverbs

The following discussion of whether eADVs project and why or why not is intended to help us understand what projects and why a step further, namely, not all non-at-issue contents have the potential to project (Simions et al. 2011), as those non-at-issue contents that are dependent of at-issue content have no such potential.

3.1 Embeddability of eADVs

According to the definition and hypotheses in (1), the first question we should ask is whether eADVs are embeddable in entailment-cancelling contexts, as if not, there is no point discussing their projective meanings.

The question of embeddability does not arise for CI triggers of other kinds. Appositive relative clauses (ARCs), or expressives, can be embedded in entailment-cancelling contexts such as negation, modals, questions, or conditionals. This is actually why the former were once mistaken to be presupposition triggers. The same also applies for discourse particles such as even, but, therefore.

The case of eADVs is special, as not all of them are embeddable in an entailment-cancelling operator. For instance, in Manarin Chinese, the eADV buxing, ‘unfortunately’ can be embedded in most of the following contexts whereas kexi ‘regretably’, is not embeddable under any of the contexts, shown in (13).

(13) a. zhangsan meiyou ?buxing/*/kexi xunzhi. Zhangsan NEG unfortunately/regretably die at work ‘Zhangsan didn’t fortunately/regretably die at work.’
   b. yexu zhangsan buxing/*/kexi xunzhi le. Maybe Zhangsan unfortunately/regretably die at work ASP ‘Maybe Zhangsan unfortunately/regretably died at work.’
   c. zhangsan buxing/*/kexi xunzhi le ma? Zhangsan unfortunately/regretably die at work ASP Q-PARTICLE ‘Did Zhangsan unfortunately/regretably die at work?’
   d. ruguo zhangsan buxing/*/kexi xunzhi le, tade jaren jiu mei yikao if Zhangsan unfortunately/regretably die at work ASP, his family then NEG support le. PARTICLE ‘If Zhangsan, unfortunately/regretably died at work, his family will be out of support.’

The anticollocational relation between eADVs and negation has been noted in the literature. Nilsen (2004) labels eADVs as positive polarity items (PPIs), as they are excluded in downward entailing (DE) contexts.
(14) shows that the German eADV is subject to a distributional restriction in comparison to its adjective counterpart.

(14)  

a. Es ist **nicht** traurig dass Otto krank ist.  
It is not **tragic** that Otto **is sick.**  
‘It is not tragical that Otto is sick.’

b. *Otto ist **nicht** traurigerweise krank.  
Otto is not **tragically sick**

Liu and Soehn (2009) report on their corpus- and psycholinguistic studies that validated the PPI-status of all tested eADVs\(^4\) in German, i.e. they cannot stand in the semantic or syntactic scope of negation. The eADV *leider* ‘unfortunately’ also cannot occur in modals, questions or conditionals. In terms of distribution, it is as unembeddable as *kexi* ‘regretably’. In comparison, the eADV *unglücklicherweise* ‘unfortuantely’ has a freer distribution, namely, it can occur in conditionals.

(15) *leider* and *unglücklicherweise* in entailment-cancelling contexts

a. Otto ist nicht #leider/#unglücklicherweise krank.  
Otto is not #**unfortunately** krank  
‘If Otto is, unfortunately, sick, the seminar must be cancelled.’

b. Otto ist vielleicht #leider/#unglücklicherweise krank.  
Otto is maybe #**unfortunately** krank  
‘If Otto is, unfortunately, sick, the seminar must be cancelled.’

c. Ist Otto #leider/#unglücklicherweise krank?  
is Otto #**unfortunately** krank  
‘If Otto is, unfortunately, sick, the seminar must be cancelled.’

d. Wenn Otto #leider/unglücklicherweise krank ist, muss das Seminar ausfallen.  
If Otto #**unfortunately** krank is, the seminar must be cancelled  
‘If Otto is, unfortunately, sick, the seminar must be cancelled.’

Interestingly, the embeddability of the two German eADVs is compatible with their factitivity: *leider* is factive and not embeddable whereas *unglücklicherweise* is nonfactive and embeddable in conditionals. Based on this, I propose a co-relation between the two features of eADVs:

(16)  

a. **factive** eADVs: nicht embeddable, e.g. Chinese *kexi* ‘regretably’, *xingkui* ‘luckily’, German *leider* ‘unfortunately’

b. **nonfactive** eADVs: embeddable, e.g. Chinese *buxing* ‘unfortunately’, English *unfortunately*,

---

\(^4\)Tested eADVs in Liu and Soehn (2009):

(i)  

*erstaunlicherweise* ‘surprisingly’
*geheimnissvollerweise* ‘mysteriously’
*glücklicherweise* ‘fortunately’
*tragischerweise* ‘tragically’
*unglaublicherweise* ‘unbelievably’
*unglücklicherweise* ‘ unfortunately’
*zweckmäßigerverweise* ‘expediently’

89
Apparently, only the second type of eADVs are relevant for the discussion of whether eADVs project. But even among this type, there is variation. For example, the German eADV *unglücklicherweise* and English *unfortunately* tend not to occur in entailment-cancelling operators other than conditionals. This means that the categorical distinction between factive/nonfactive eADVs is probably not fine-grained enough. But for the current purpose, I will restrict the discussion to conditionals where nonfactive eADVs can occur.

### 3.2 The Projection of eADVs in Conditionals

According to Asher (2000), parenthetical and discourse adverbials (including eADVs) have two features in common with CPs: First, both project out of the context in which they occur, i.e. failure in the embedding test (Wilson 1975), i.e. they do not fall within the scope of *if* when embedded in the antecedent of a conditional. Take an eADV and an evaluative adjective (eADJ) for example, the evaluative content of the former and the presupposition of the latter both fail in the embedding test, as shown below.

\[
\begin{align*}
\text{(17) Failure of eADJs/eADVs in the embedding test:} \\
\text{a. If it is sad that Michael Jackson died, I would not be surprised. } & \not\rightarrow \\
& \text{If Michael Jackson died and it is sad that Michael Jackson died, I would not be surprised.} \\
& \text{If Michael Jackson died and it is sad that Michael Jackson died, I would not be surprised.} \\
\text{b. If Michael Jackson, sadly, died, I would not be surprised. } & \not\rightarrow \\
& \text{If Michael Jackson died and it is sad that Michael Jackson died, I would not be surprised.}
\end{align*}
\]

The second common feature between parentheticals/discourse adverbials and presuppositions is that both convey propositions, once certain anaphorically underspecified elements are resolved. van der Sandt (1992) treats presupposition projection as anaphora resolution; in SDRT, presuppositions must be attached to some part of the discourse context via a restricted range of discourse relations e.g. Background, Defeasible Consequence, Parallel. Asher treats parentheticals/discourse adverbials as anaphoric and like presuppositions, they must attach to some part of the discourse context via a discourse relation, but he claims that they prefer a different attachment: e.g. to a constituent formed from the asserted clause, and e.g. via a discourse relation of Commentary or Evidence.

By comparison, we can look at the three ideas in a chronologcal order. Asher (2000) focuses more on the resemblance between CIs and CPs except that they require attachment via different discourse relations; Potts (2005) focuses on the difference between CIs and CPs; Simons et al. (2011) again focuses on the parallelism between CPs and some CIs, i.e. both as triggers of projective meanings. I do not aim to give a big picture of CPs and CIs for the time being, but discuss the strength and weakness of each proposal relevant to eADVs.

First, the standard analysis of unembedded CIs according to Potts (2005) is restated below, with the case of appositive nominals (ANs) and eADVs for comparison:

\[
\begin{align*}
\text{(18) a. Chomsky, the best linguist ever, is going to give a lecture on state terrorism.} \\
& \text{(i) At-issue content: Chomsky is going to give a lecture on state terrorism.}
\end{align*}
\]
While the CI content as stated in (18-a-ii) is exactly the projective meaning of the sentence embedded in conditionals, as shown in (19), the CI content as stated in (18-b-ii) is not the projective meaning of the sentence in (20), although it does survive as an inference from the sentence. The latter sentence is reported to have three possible readings, with the second reading as the preferred one.

(19) If Chomsky, the best linguist ever, gives a lecture on state terrorism, he will need some bodyguards.
→ Chomsky is the best linguist ever and if he gives a lecture on state terrorism, he will need some bodyguards.

(20) If the party, unfortunately, is over, then we have to find somewhere else to get a drink. (Asher 2000)
   a. Reading 1: If the party is over, then we have to go somewhere else to get a drink; it is unfortunate that if the party is over, then we have to go somewhere else to get a drink.
   b. Reading 2: If the party is over, then that is unfortunate; if the party is over, then we have to go somewhere else to get a drink.
   c. Reading 3: If the party is over, then we have to find somewhere else to get a drink; it is unfortunate that we have to find somewhere else to get a drink.

(20) poses two problems for Potts’ (2005) analysis of eADVs. First, in Potts (2005), eADVs take the sentence to which they are attached to as their argument. Problems arise when we extend our attention to embedded eADVs. Although Potts’ logic is claimed to be a compositional and recursive system, it seems that the CI content that embedded eADVs trigger cannot be computed compositionally. Otherwise, we would only get Reading 2 for the sentence. Asher, instead, claims that parentheticals and discourse adverbials have an argument that needs to be specified, but they do not by themselves specify what this argument is or what the discourse relation that relate them to the argument is. These are left to independent processes of anaphora resolution and SDRT’s computation of discourse relations respectively (Asher 2000: 36). The second problem is, that, if we follow Potts’ (2005) widest scope hypothesis for CIs, the first reading is fully predictable, but the other two readings are not predictable.

The latter two readings in (20) also pose a problem for the SDRT framework: conditionals are non-veridical in its semantics, whereas eADVs are usually attached via the discourse relation of Commentary, a veridical relation. This leads to a conflict, due to which Asher (2000: 42) proposes “When a preferred veridical relation cannot be used because of conflict with the non-veridical, conditional status of the chosen attachment point \( \pi_c \), attach Defeasible Consequence to \( \pi \)”.

In this approach, the eADV is not treated as a factive predicate anymore, which is compatible with my distinction of eADVs in terms of factivity. Only nonfactive eADVs can be embedded in (some of the) entailment cancelling operators, whereas factive eADVs are not embeddable because their lexical semantics requires the attachment to be always via the
discourse relation of Commentary.

While Asher’s solution of attachment via a different discourse relation is pragmatic in nature, the distinct semantics for factive and nonfactive eADVs that I postulate can provide a semantic solution, which not only accounts for the unembeddability of factive eADVs but also the projection of nonfactive eADVs in conditionals. Take sentences with the German eADVs leider and unglücklicherweise for example: they have the following semantic compositions.

(21) a. Otto ist leider krank.
   ‘Otto is, unfortunately, sick.’
   (i) At-issue content (p<sup>a</sup>): The party is over.
   (ii) CI ([unfortunate (p)]<sup>c</sup>): It is unfortunate that the party is over.
   Presupposition of the CI (r<sup>vc</sup>): The Party is over.

b. Otto ist unglücklicherweise krank.
   ‘Otto is, unfortunately, sick.’
   (i) At-issue content (p<sup>a</sup>): The party is over.
   (ii) CI ([p → unfortunate (p)]<sup>c</sup>): If the party is over, it is unfortunate.

_Leider_ cannot be embedded in entailment cancelling contexts, because in these contexts the speaker on the one hand does not commit to the truth of the at-issue content p<sup>a</sup> while at the same time presupposes p<sup>a</sup> by use of the eADV - a semantic clash would arise. Details will be given on another occasion.

English eADVs such as Sadly, unfortunately are all nonfactive and embeddable, and thus have a conditional lexical semantics, as unglücklicherweise. With a conditional CI content, (20) results in the three available projective meanings / CIs as in the fourth column of the following table. The CI content in the third reading slightly differs from what Asher (2000) reports in (20-c), but they do not contradict with each other, as even when the eADV takes the consequent as its propositional argument, the derived meaning can be read with modal subordination, i.e. the one I give here.

(22) Projection of nonfactive eADVs in conditionals

<table>
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<tr>
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<tr>
<td>(20-a)</td>
<td>(p → q)&lt;sup&gt;a&lt;/sup&gt; • unfortunate (p → q)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Commentary</td>
<td>(p → q)&lt;sup&gt;a&lt;/sup&gt; • ([p → q] → unfortunate (p → q))&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>(20-b)</td>
<td>(p → q)&lt;sup&gt;a&lt;/sup&gt; • unfortunate (p)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Defeasible Consequence</td>
<td>(p → q)&lt;sup&gt;a&lt;/sup&gt; • [p → unfortunate (p)]&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>(20-c)</td>
<td>(p → q)&lt;sup&gt;a&lt;/sup&gt; • unfortunate (q)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Defeasible Consequence</td>
<td>(p → q)&lt;sup&gt;a&lt;/sup&gt; • [q → unfortunate (q)]&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Potts’ (2005) analysis of sentences with eADVs, as in the second column, works for unembedded eADVs. However, in the discussion of projective meanings, factive eADVs are not embeddable as they trigger a CI content that presupposes the at-issue content, and therefore, have an interdependence relation with the at-issue content. Logically speaking, a trivalent logic results in rather than a four-valued logic. In the case of nonfactive eADVs, we have a four-valued logic but a different CI content. This content projects as it is logically independent of the at-issue content, be it the antecedent or the consequent or the whole conditional. Projective meanings of other kinds have in common that their projective meaning is independent of the at-
issue content, as summarized in (23).

(23) a. CPs project:
   (i) an at-issue content is undefined if its CP is false; the CP is independent of the at-issue content in terms of truth values.
   (ii) a CI content is undefined if its CP is false; the CP is independent of the CI content in terms of truth values.

b. CIs that project (ANs/ARCs, expressives, honorifics): the CI content and the at-issue content are independent of each other in terms of truth values.

The conditional lexical semantics for nonfactive eADVs enables them to have a projective meaning, as it is independent of any at-issue content. Through this, there is neither semantic incoherency that we would have by following Potts (2005) nor need for pragmatic explanations (Asher 2000). While Asher (2000) assumes that eADVs are attached via the discourse relation of Commentary by default and it is changed to Defeasible Consequence to avoid semantic conflicts, in my account, nonfactive eADVs always project a conditional CI, with the propositional argument resolved anaphorically or cataphorically (e.g. in the case of (20-c)). The evaluative content, i.e. the consequent of the conditional CI in (20-a) is entailed simply by modus ponens.

Based on the discussion above, I propose to revise the hypotheses about what projects and why in (Simons et al. 2011) with one more constraint.

(24) Hypotheses about what projects and why (revised version 1):
   a. (i) All and only those implications of (embedded) sentences which are not-at-issue relative to the Question Under Discussion in the context have the potential to project.
   (ii) Only those implications of (embedded) sentences which are independent of at-issue content in terms of truth values can project.

b. Operators (modals, negation, etc.) target at-issue content.

Although the revision is still preliminary, an extra argument that we need further constraints on what projects is that ANs sometimes fail to project (Schlenker 2010a, 2010b).

4 Supplements that do not project

Schlenker (2010a, 2010b) proposes an alternative analysis of ANs or ARCs to Potts’ (2005) two-dimensional approach. One of his arguments is that embedded ARCs can syntactically be attached to the matrix level, which leaves a separate semantic dimension unnecessary to deal with their taking widest scope. His second argument, more relevant to the current study, is that embedded ANs/ARCs sometimes prefer lower syntactic attachment, which makes Potts’ (2005) widest scope hypothesis even undesirable. I show that the latter argument also challenges Simons et al.’s hypothesis of what projects.

(25) Examples from Harris and Potts (2009), discussed in Schlenker (2010a, 2010b)
   a. I am increasingly worried about my roommate. She seems to be growing paranoid.
(i) The other day, she told me that we need to watch out for the mailman, a possible government spy.

(ii) The other day, she refused to talk with the mailman, a possible government spy.

b. My brother Sid hates school.

(i) He says that he puts off his homework, a complete waste of time, to the last minute.

(ii) He puts off his homework, a complete waste of time, to the last minute.

As Harris and Potts (2009) reports, the content by the AN ‘a possible government spy’ in (25-a) is attributed to the speaker’s roommate rather than the speaker. In other words, it fails to take widest scope and thus does not make a speaker-oriented content. Intuitively, if this content does project so that the speaker commits himself to the truth that the mailman is a possible government spy, this will contradict with his former attitude that he thinks his roommate is growing paranoid. The same goes for (25-b), in which the content by the AN ‘a complete waste of time’ takes narrow scope.

This provides another counterexample to Simons et al.’s (2011) hypothesis that “All and only implications of (embedded) sentences which are not-at-issue relative to the Question Under Discussion in the context have the potential to project”, in that this is not restrictive enough. In the case of eADVs in conditionals, I attribute the fact that factive eADVs are unembeddable while nonfactive eADVs project to their distinct semantics; in the case of (25), embedded implications that have the potential to project fail to do so for discourse reasons. Both cases, I think, should be taken into account in a theory of projective meanings.

The data and discussion points at a unified category of projective meanings due to the common features that CPs and projecting CIs share. I suggest a further constraint on Simions et al.’s (2011) hypotheses, namely, only those implications of (embedded) sentences which do not lead to semantic or pragmatic contradictions with the rest of the discourse can project.

Before I conclude, I want to address one problem in Schlenker (2010b). The author compares supplements with presuppositions: they are both not at-issue; while presuppositions must be trival usually, supplements must be non-trival usually. As to the second point, he discusses definite descriptions containing adjectives and contrasts the following examples in that (26-a) is fine because the ‘apparently redundant’ adjective blond triggers an informative presupposition, i.e. a presupposition that is easy to accommodate and help the conversation, while (26-b) is odd because the adjective blond is indeed redundant and thus, its presence violates the pragmatic principle of brevity.

(26) a. Alfredo Emilio Koch started his 1,300-acre vineyard and winery in the 1950s and named it “La Juanita”, honoring his New Yorker wife, Mary Jane Bergen.

b. John’s blond father has arrived.

However, the contrast does not seem so sharp as intended. Instead, we can easily come up with contexts in which sentences similar to (26-b) are not odd at all. In the examples from the internet below, the content by the adjective blond in (27-a) can be said to be non-trival, as it contributes to make a contrast in discourse; by the same criterion, the content by the same adjective in (27-b) seems not to be of so much interest to the conversation, but the sentence still does not sound odd at all.
a. But Stuart closely resembles his dark-haired dad Richard, 31 and Heather looks just like her blond father Jerry, 29.

b. He has readily absorbed the tennis tips offered by their jovial blond father, the donor of the heavily ornamented sterling silver bowl for winners of amateur international tennis team competition.

More crucially, I am not sure that such nominal modifiers trigger a presupposition, as no at-issue content will be undefined even if relevant content fails to be true. Instead, they differ from the existence/uniqueness presuppositions that arise due to a definite description without any modifier. What I also do not understand is if the adjective triggers a presupposition in one sentence, why should it stop doing so in a different sentence? Accordingly to my intuition, such cases of ‘informative presuppositions’ as in (26-a) and (27-b) are CIs: they are not at-issue; they are non-trivial. They are interesting because in English, adjectives are integrated in the nominal phrase, different from the case of relative clauses - ARCs are always non-integrated, whereas RRCs (restrictive relative clauses) are integrated. For this reason, it is hard to tell whether an adjective is used restrictively or appositively. They resemble the case of relative clauses in Chinese, which, just like adjectives, are always integrated in the NP. Pragmatics is needed to tell when they contribute to narrow down the nominal domain and when they only have a “weak semantic contribution”.

If I am right that Schlenker’s (2010b) case of informative presupposition are actually CIs, it will be no wonder that in these cases, “the mechanism of context update is similar to our analysis of supplements” (Schlenker 2010b). In general, there is left a lot to be done, especially on integrated CIs across languages.

5 Conclusion

In this paper, I first discuss the distributional and logical differences between factive/nonfactive eADVs and propose distinct lexical semantics for them. Then, I show that the difference can also account for their projection behaviors: factive eADVs are not embeddable in entailment-cancelling contexts because they presuppose the at-issue content that they modifier and nonfactive eADVs have a conditional semantics and trigger a CI, which is independent of the at-issue content. This case and the case of embedded ANs/ARCs (in attitude predicates) that fail to project lead to a revision of Simons et al.’s (2011) hypotheses as follows:

(28) Hypotheses about what projects and why (revised version 2):

a. All and only those implications of (embedded) sentences which are not-at-issue relative to the Question Under Discussion in the context have the potential to project.
   (i) Only those implications of (embedded) sentences which are independent of at-issue content in terms of truth values can project.
   (ii) Only those implications of (embedded) sentences which do not lead to semantic or pragmatic contradicts with the rest of the discourse can project.

b. Operators (modals, negation, etc.) target at-issue content.
Despite the differences between CIs and CPs, they have features in common. What remains to be done, is, among other things, a careful look at cases where CPs fail to project for semantics or discourse reasons. If CIs/CPs not just project for a similar reason (i.e. when they trigger an implication that is independent of the at-issue content) but also fail to project for similar reasons, this will argue more for a unified category of ‘projective meanings’. This I leave for future study.

References

Liu, M. The Undefinedness of Conventional Implicatures. in: *Proceedings of Moscow Syntax and Semantics (MOSS)* 2. (in preparation)
Schlenker, P. Supplements within a Unidimensional Semantics II: Epistemic Status and Projection. In the Proceedings of the *NELS* 2009. (2010b)
Projective meaning and implicature cancellation

Laia Mayol (UPF)
Elena Castroviejo (CCHS-CSIC)

Abstract

It has been a matter of recent debate what is the relationship between different
levels of meaning and what interactions between them are possible (Potts 2005, Roberts et al.
2008). This paper deals with these interactions as far as implicature cancellation is concerned.
We aim to show that canceling amounts to addressing a new question under discussion, which
predicts that only at-issue meaning, but not projective meaning (Simons et al., 2010) can be a
meaning canceler, and which restricts cancellations to contexts where adding a new QUD is the
right discourse move.

1 Introduction

In recent literature about the so-called levels of meaning (Potts 2005, Roberts et al. 2008), there
has been an ongoing debate about what is the relationship among them (that is, among at-issue
meaning, Conventional Implicatures, presuppositions, etc.). Are they completely independent from
each other? Are they constrained in the way they can interact? For instance, it is not clear
to what extent anaphora binding across levels is possible, as shown in (1). While in (1-a) the
binding between the pronoun and a noun phrase inside a Conventional Implicature (CI henceforth)
is possible, in (1-b) a similar interaction, with the pronoun inside a CI, it is not.

(1) From Roberts et al. (2008)
   a. Stan, who took an exam₁, passed it₁ with flying colors.
   b. *No reporter₁ believes that, as he₁ wrote, Ames is a spy.

The goal of this paper is to contribute to this debate by analyzing the properties of implicature
cancellation, an operation in which different levels of meaning are involved. Our main claim is
that canceling amounts to addressing a new question under discussion (QUD henceforth). This
proposal has two main consequences. The first one is that only at-issue meaning, but not projective
meaning—that is, presuppositions and CIs (Simons et al., 2010)—can be a meaning canceler. The
second one is that cancellations are restricted to contexts where adding a new QUD is the right
discourse move.

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2 Data

One of the paradigmatic properties of conversational implicatures (ConvI henceforth), as originally described by Grice (1975), is that they can be canceled by subsequent discourse, as shown in (2). Namely, in (2-a), the ConvI, triggered by pretty that the boy is not extremely tall is cancelled, while in (2-b), the cancelled ConvI, triggered by some, is that not all students came. Both examples are instances of scalar implicatures (Horn, 1972) in which the use of an item in an ordered scale conversationally implicates that the sentence is false with a stronger item.

(2) a. I went to the movies with the pretty tall boy that Peter had introduced me. In fact, he was extremely tall.

b. Some of my students came to the party. In fact, I believe that all of them came.

In the examples in (2), the cancellation was carried out by means of an assertion. In contrast, other types of meaning cannot carry out this operation, as shown in (3). In (3-a), the presupposition, triggered by the factive verb, that all the students came cannot cancel the implicature associated with some. In a similar way, implicature cancellation cannot be carried out by a conventional implicature, such as a non-restrictive relative clause (Potts, 2005). Example (3-b) shows that the CI meaning according to which the boy was extremely tall cannot cancel the conversational implicature that he was only pretty tall, and not taller.

(3) a. Presuppositional canceller

# Some of my students came to the party. In fact, I regret that all of them came.

b. CI canceller

# I went to the movies with the pretty tall boy that Peter had introduced me, who in fact was extremely tall.

The same can be shown for less well-known cases of ConvIs. (4) is an example of the Catalan emotive particle Déu n’hi do (which we gloss as ‘DND’).

(4) a. Déu n’hi do que alt que és en Joan! De fet, és extremament alt.

‘DND how tall John is! In fact, he is extremely tall.’ Assertion

b. # Déu n’hi do que extremament alt que és en Joan!

‘DND how extremely tall John is!’ Presupposition/CI

DND takes a wh-clause and conveys that the true proposition in the set is unusual. Unlike the emotive predicate “it’s amazing”, DND implicates that the extreme values in the set do not hold (see Mayol and Castroviejo (2009) for a full analysis). The first sentence in (4-a) asserts that John is tall to a high degree, and implicates that he is not tall to an extreme degree. This implicature is cancelled by the second assertion. In contrast, in (4-b), it is not possible to cancel the implicature by means of the adverb “extremely” within the how-phrase. This adverb in a how-clause has been analyzed either as a presupposition (D’Avis, 2002), or as a non-restrictive modifier, and hence a CI (Castroviejo, 2008). Regardless of the analysis we may adopt for “extremely”, the data in (4) point to the same direction as (2) and (3). While assertions can cancel an implicature, presuppositions
3 Previous work

Although cancellation is used as one of the main tests to identify a ConvI, there is surprisingly little work on the properties of the cancellation mechanism itself.

Gazdar (1979) argues that different types of meaning are added in a particular order to the semantic computation. In particular, his proposal is that ConvIs are added to the meaning computation before presuppositions, and only the presuppositions compatible with the existing ConvIs survive. That is, presupposition can never cancel an implicature because they are added last to the meaning computation, which explains the unacceptability in (3-a). In contrast, Gazdar’s account has nothing to say about CIs, that is about why (3-b) is not acceptable.

Other than this lack of coverage, Gazdar’s proposal is unsatisfying on two other counts. First, as noted by Beaver (2001), it is counter-intuitive that presuppositions be the last things added to the computation, since they are usually thought as preconditions for felicitous utterance interpretation. Second, the account crucially relies on a stipulated ordering between ConvIs and presuppositions and not on a principled explanation.

4 Proposal

In this paper we attempt a more intuitive analysis that accounts for the facts and that explains the properties of implicature cancellation. Our analysis can be summarized as follows: (i) the operation of canceling requires the generation of a new QUD and (ii) since projective meaning (presuppositions and CIs) cannot generate a new QUD, it cannot carry out a canceling operation.

We assume Robert’s (1996) formalization of the discourse topic as the QUD as well as the relationship that she establishes between the QUD and the focus of the sentence. More specifically, we adopt Robert’s Question-Under-Discussion constraint on Focus, which states that any utterance of B has the presupposition that the last QUD denotes the set of propositions which constitutes the focus semantic value of B, as shown in (5).

\[ \text{(5)} \quad \text{The Question-Under-Discussion constraint on Focus (Roberts, 1996)} \]

An utterance B whose logical translation is of the form \( \beta \) or \(?[\beta] \), where \( \beta \) is a formula, is felicitous only if \( [\beta]^f = \text{last(QUD[B]^p)} \).

Our second assumption has to do with our ontology of meanings. We take there to be three major kinds of meanings: at-issue, projective and ConvIs. Along the lines of Potts (2005), at-issue meaning is the descriptive content contributed by an assertion. Following Simons et al. (2010), projective meaning includes CIs and presuppositions, which share one core property: they do not address the QUD. The main distinction between the two is that whereas presuppositions convey preconditions
for a successful context update, CIs represent side comments by the speaker which do not need to hold true prior to the update with the sentence containing the CI. Finally, ConvIs do address the QUD. In fact, they are at-issue strengtheners, since they force a stronger reading of the asserted content.

In this paper we propose a definition of the operation of cancelling. We claim that it represents a context update of the cancelling sentence $q$ on the previous context $c$ (i.e., $c + q$), where $q$ entails the previous assertion $p$ ($q \subseteq p$), but not its ConvIs ($q \not\subseteq \text{ConvI}(p)$). This is to say that when we make an utterance that entails the at-issue content of our own previous assertion but not its ConvI, then we are making a cancellation. Furthermore, this operation is compliant with the constraint we phrase as (6):

\begin{align*}
(6) \quad & \text{The QUD constraint on Cancellation} \\
& \text{The operation of canceling presupposes a QUD } ?q, \text{ such that QUD } ?q \neq \text{last(QUD).}
\end{align*}

That is, for an utterance to be able to cancel, the current QUD needs to be different from the previous one; there needs to be a change of QUD. In what follows, we illustrate cases of felicitous and infelicitous cancellations, and show how (6) is able to correctly derive the judgments.

### 4.1 At-issue cancellations

In (7) we see an instance of a felicitous cancellation.

\begin{align*}
(7) \quad & \text{a. Who has two cars?} \\
& \text{b. [I}\ F\text{] have two cars.} \\
& \text{c. Actually, I have [three}\ F\text{].}
\end{align*}

Why is (7-c) felicitous? First, observe that the assertion in (7-b) matches with the (explicit) QUD in (7-a). By the QUD constraint on Focus, it follows that the corresponding QUD should be precisely the one spelled out in (7-a). Now, as we proposed in the previous section, the cancellation in (7-c) entails the assertion in (7-b), but not its ConvIs (i.e., having three cars entails having at least two cars, but not having exactly two cars). If we apply the QUD constraint on Focus to (7-c), it follows that a plausible QUD would be something along the lines of “How many cars do you have?” Since the QUD of (7-c) does not coincide with the QUD in the previous utterance, the QUD constraint on Cancellation is satisfied, and the result is a felicitous cancellation.

Now, let us look at an instance of infelicitous cancellation, such as the one illustrated in (8).

\begin{align*}
(8) \quad & \text{a. How many cars do you have?} \\
& \text{b. I have [two}\ F\text{] cars.} \\
& \text{c. # Actually, I have [three}\ F\text{].}
\end{align*}

As in (7-a), (8-a) spells out the QUD that (8-b) is an answer to (the focus on “two” yields a QUD that inquires about amounts). By the same token, in (8-c), the QUD constraint on Focus predicts that the QUD be (8-a), too. Hence, the QUD of (8-c) coincides with the QUD in the last utterance. Therefore, the QUD constraint on cancellation is not satisfied. Certainly, (8-c) per se
is not infelicitous, but it is only possible as long as we interpret it as a self-correction or as an afterthought. However, it is not a *bona fide* implicature cancellation.

### 4.2 Impossible projective meaning cancellations

So far, we have shown that the QUD constraint on Cancellation derives the desired judgments for the two cases we have examined. However, we have only discussed cancellations carried out by at-issue content. Now it is the turn to explain why projective meaning cannot cancel a ConvI.

We have argued that in order for an utterance to be a meaning canceller, it has to generate a QUD that does not coincide with the QUD of the previous utterance. This condition will never be met by projective meaning; presuppositions and CIs cannot introduce a new QUD. As it happens, they cannot even address the current QUD, as observed by Simons et al. (2010), since its discussion function is to introduce either a precondition or a side-comment. The fact that projective meaning cannot address the current QUD is illustrated in (9) and (10).

(9)  A: Who came to the party?  
     B: #It’s odd that John came.  
(10) A: How do you feel about your neighbor?  
     B: #I just saw that bastard John.

The inability of projective meaning to generate a new QUD is related to the fact that only (certain) speech acts can generate one, to begin with. Furthermore, projective meaning does not constitute a speech act by itself, but depends on the content of an assertion or a question (which are speech acts). In other words, there is not a speech act of presupposing, but a presupposition is triggered by certain lexical items, and accompanies the speech act of asserting or questioning. The same is true for CIs.

Take for instance the possible QUD generated by B’s assertions in (9) and (10). In (9), the presupposition (i.e., that John came) is triggered by the assertion of the factive predicate *it’s odd*. The QUD Constraint on Focus forces that the QUD that the answer in (9) is addressing is “What do you think about John coming?” ((11-a)), and not a QUD generated by only the embedded presupposition. In other words, the question-answer pair in (9) is not congruent: the question would require an answer with *John* in focus, unlike what happens in the answer.

Turning now to (10), even though the meaning conveyed by the expressive *bastard* can be treated as a second assertion of the sort “The speaker holds a negative attitude toward the addressee.”, the properties of projective meaning prevent it from generating its own QUD. It cannot be used to answer an inquiry about the speaker’s feelings. On the other hand the sentence the CI is embedded in, which constitutes at-issue meaning, does generate its own QUD, shown in (11-b).

(11) a. (9) $\leadsto$ QUD: What do you think about John coming?  
     b. (10) $\leadsto$ QUD: Who did you just see?

To summarize, the projective meanings contained in an utterance (such as factive presuppositions and CIs) cannot generate their own QUD and, thus, cannot be used to address one. In consequence,
the QUD constraint on Cancellation will never be satisfied: projective meaning cannot cancel an implicature because it can never change the QUD.

### 4.3 Naturally-occurring examples

Our discussion has used so far constructed examples. In this section, we will discuss naturally-occurring examples. These examples were found by searching markers which can be used to introduce an implicature cancellation, such as “actually” or “in fact”. Most examples seem to comply with the QUD constraint on Cancellation. Consider (12) to begin with.

(12) Some things about trekking in Nepal. The “Everest Base Camp” trek as well as the “Around Annapurna” trek are regarded some of the best trekking routes in Nepal and actually all over the world. ([http://guyshachar.com/content/blog/1997/trekking-in-nepal/](http://guyshachar.com/content/blog/1997/trekking-in-nepal/))

This sentence is produced by a blogger who posts about “Some things about trekking in Nepal.” From the context, we accommodate that a possible QUD for the utterance could be (13-a). In contrast, the QUD of the utterance of the second conjunct (“and actually all over the world”) could be something along the lines of (13-b).

(13) a. QUD1: What are the best trekking routes in Nepal?
   b. QUD2: Are these treks considered the best only in Nepal?

Note that the kind of implicature that gets cancelled has to do with the width of the comparison class relevant to the expression “best trekking routes”. The literal meaning of the sentence would be “the best trekking routes considering Nepal as the smallest comparison class” and the implicature that is generated would be an exact reading of the sort “the best trekking routes considering Nepal as the exact comparison class.” By uttering “and actually all over the world”, the speaker prevents the addressee from interpreting the sentence with the exact reading.

In (14), we have an explicit question that is answered by a complex sentence that contains a cancellation.

(14) What are some baroque, classical, and romantic compositions that are dark and moody? Mahler Symphony No. 10 – actually, all of the Mahler symphonies have dark sections. ([http://answers.yahoo.com/question/index?qid=20100630180022AAtmG3w](http://answers.yahoo.com/question/index?qid=20100630180022AAtmG3w))

Hence, we know that the first clause is answering the QUD in (15-a). Crucially, the second clause is not a reply to (15-a) but to a different, implicit QUD that could have the shape of (15-b).

(15) a. QUD1: What are some baroque, classical, and romantic compositions that are dark and moody?
   b. QUD2: How many of Mahler’s symphonies have dark sections?

The fact that we have two different QUDs is what enables the interpretation of the second clause as an implicature canceller. Here, the implicature that the addressee could generate would be one
where “Malher Symphony No. 10” is the only dark and moody work by Mahler. Otherwise, the speaker would have provided more information. To prevent this kind of reading, the speaker adds a follow-up introduced by “actually” that points out that all of Mahler’s symphonies have these properties.

Finally, consider example (16). This is a case where the “in fact” clause cancels a possible exact reading of the phrase “quite interesting”.

(16) Yeah, I admit I do find Putin quite interesting... in fact very interesting if not fascinating.  
(http://www.russianwomendiscussion.com/Forum/index.php?topic=8091.905;wap2)

The first clause is clearly the answer to a yes/no question. From the context of this utterance, which appears in an internet forum, we learn that it is an answer to (17-a). On the other hand, the “in fact clause” is not replying the same QUD, but rather (17-b). This makes this sentence a proper implicature cancellation.

(17) a. QUD1: Do you find Putin interesting?  
   b. QUD2: How much interesting?

As many naturally-occurring excerpts as we have found that abide by the QUD constraint on Cancellation, we have also found challenging cases such as the one in (18), where is it not obvious that the second conjunct answers a different QUD than the first one.

(18) One night in Beijing. Well actually two.  
(http://www.puddingandchopsticks.com/2010/12/06/one-night-in-beijing-well-actually-two)

Two comments are in order. First, this sentence is the headline of a post in a blog. It is a matter of debate whether headlines also represent answers to QUDs. If this were not the case, then the QUD constraint on Cancellation would not apply. Second, it is probably the case that the speaker (the blogger) is playing with the violation of the constraint on cancellation as a rhetorical device. (Note that the option of considering the “actually” clause an afterthought is less plausible since we are dealing with a piece of written language, although not in a formal register.)

To sum up, an informal search of naturally-occurring examples of cancellation indicates that most examples comply with the QUD constraint on cancellation. We leave it for future work to perform a more thorough corpus study of cancellation markers.

5 A competing theory

Before presenting our conclusions, we would like to briefly consider a competing theory to the QUD constraint on Cancellation, which we will call the “Focus constraint on Cancellation”.¹ This theory could be summarized as in (19):

¹We thank Maribel Romero for bringing to our attention this other plausible approach to the cancellation data.
The Focus constraint on Cancellation
Linguistic material in a Focus position cannot be cancelled.

That is, this theory simply states that the implicature triggered by an item in a Focus position cannot be cancelled. An equivalent way of expressing this idea would be to say that an item on focus does not trigger implicatures, but only asserted content, which, by definition, cannot be cancelled.

This theory can explain the contrast between (7) and (8): in (7) the implicature associated with the numeral *two* can be cancelled because the numeral is not on focus position, while in (8), since the numeral is on focus position, its implicature either cannot be cancelled or this meaning is asserted to begin with (and is, therefore, not cancellable).\(^2\)

In order to tell the two theories apart, we would need either (i) to find a case of a felicitous cancellation in which the implicature is triggered by material in focus and there is a change of QUD or (ii) a case of an infelicitous cancellation in which the implicature is not triggered by material in focus and there is no change of QUD.

The first type of examples seem, unfortunately, impossible to construct: we cannot have a discourse in which there is both a change of QUD and a cancellation of an implicature triggered by material in focus. To mention a specific case, consider the implicature triggered by a numeral (i.e., the exact reading). If the numeral is focused, by the QUD constraint on Focus, the first QUD will be of the shape “how many \(x\)?”. If the assertion is followed by a cancellation of the exact-reading implicature (such as “Actually, I have three” (cf. (7-c))), the QUD of this utterance will also necessarily be of the shape “how many \(x\)?”. Thus, the shape of the two QUDs is the same, there is no change of QUD and, therefore, the QUD constraint on Cancellation will never be satisfied.

Fortunately, it is possible to construct the second type of discourses. In fact, the Focus constraint on cancellation seems to run into problems precisely with cancellations carried out by projective meaning. That is, this theory would predict that if the item that triggers the implicature is not on focus, it can be cancelled, regardless of whether the canceller is at-issue or projective meaning. However, this does not seem to be the case, as shown in (20). Although the numeral is not part of the focus, it cannot be cancelled by presuppositional material, since presuppositions cannot trigger a QUD change.

\[(20)\]
\[
a. \quad \text{Who has two cars?} \\
b. \quad \#[I_F] \text{ have two cars. In fact, I regret having three.}
\]

To sum up, in this section, we have considered a competing theory, according to which implicatures triggered by material in focus cannot be cancelled. Although both the QUD constraint on Cancellation and the Focus constraint on Cancellation make the same predictions to a certain extent, the former can readily explain why it is not possible to cancel non-focal material when the meaning canceler consists of projective meaning, while the latter cannot.

\(^2\)We address the interested reader to Geurts (1998) and subsequent work for a discussion on how the two readings evoked by numerals arise.
6 Conclusions

In this paper we have taken a close look at the phenomenon of implicature cancellation: we have discussed what properties it has and, more importantly, what restrictions it obeys. We have proposed that implicature cancellation is subject to the Question-Under-Discussion constraint on Cancellation. In a nutshell, a cancellation is carried out by a sentence that presupposes (and answers) a different QUD from the previous utterance. The intuition behind this proposal is that a cancellation is a legitimate move only if the cancelled content was not really the main point of the speaker’s previous move. Otherwise, why would the speaker have chosen to produce an implicature only to cancel it in the next utterance? In contrast, if the speaker’s main goal was something else, he can later change the orientation of the discourse to address the implicated meaning.

In addition, we have pointed out that since projective meaning (presuppositions and Conventional Implicatures) does not have the potential to address the QUD (Simons et al. (2010)), it cannot presuppose a new QUD and, thus, cannot cancel conversational implicatures.

This work is relevant for the current discussion about the relationship between different types of projective meaning. In particular, we have identified an additional property that presuppositions and Conventional Implicatures share, namely their behavior as far as implicature cancellation is concerned; none of them is able to raise a new QUD, because only at-issue content can.

Since we have focused on the properties of the content that can cancel other content, the natural follow-up of this research is the discussion of which levels of meaning can be cancelled or suspended, as well as what are the differences between cancellation and suspension.

Finally, we expect that experimental data can provide us with additional criteria to be able to choose between the proposal defended here and the competing theory that relies exclusively on the properties of focus to account for the facts.

References


1 Introduction

Beaver (2001) was the first author who, to my knowledge, put forward a hypothesis as to why, after the utterance of compound sentences that carry a presupposition in the second clause, sometimes the hearer accommodates a ‘conditional presupposition’. The accommodation of ‘conditional presuppositions’ has recently drawn the attention of other researchers (Schlenker 2010) and the hypothesis that it is possible to accommodate this type of presupposition has even been tested by experimental methods (Chemla & Schlenker 2011). However, so far, no convincing explanation has been given for this phenomenon. I propose that what is accommodated is not a ‘conditional presupposition’ but a certain generalization (in a sense to be explained) and that the conditional inference, which arises in conditional and disjunctive sentences and is essential so that the hearer may infer the generalization, instantiates the latter. Put it another way, sometimes, by uttering a compound sentence that carries a presupposition in its second clause, the speaker commits himself not to the truth of the clausal presupposition but to the truth of a generalization, which is inferred and accommodated by the hearer. The fact that the hearer has to infer the generalization is crucial; otherwise, as has been argued in the literature (Geurts 1996, Singh 2008), the generalization might be just a piece of ‘world knowledge’ which would be known by all the participants in the conversation before the sentence is uttered. So, I will provide an explanation that accounts for the process whereby the hearer infers the generalization. Furthermore, I will argue that this type of presupposition is not exclusive to conditional and disjunctive sentences but that also conjunctions may presuppose generalizations. Nonetheless, in conjunctions, the conditional inference is absent and, furthermore, the clausal presupposition is an entailment of the whole sentence. However, I will show that it is possible to reproduce the notion of sufficient condition so that it may be reflected in conjunctions and that, though the clausal presupposition is entailed by the whole conjunction, it is not the condition that the sentence imposes on the context of utterance (the global context) in order to be interpretable, unlike what happens in more run-of-the-mill cases.

The article is organized as follows: I will start by reviewing the explanations provided in the literature in order to account for this phenomenon. I will go on explaining my own hypothesis, focusing first on conditional sentences; I will address three types of conditional sentence which, at first blush, seem to be very different but, upon the utterance of which, the hearer infers a generalization. The discussion will be centered on explaining the process by which the hearer infers the generalization, and we will see that the
process is the same in the three cases. Finally, I will show how this hypothesis may be extended to disjunctive and conjunctive sentences.

2 The phenomenon in the literature

Karttunen (1973) notes that the compound sentences in (1a), (1b) and (1c) do not ‘inherit’ the clausal presupposition in (1d). According to Karttunen, the generalization in (1f) is an element of a set of ‘assumed facts’ which, together with the first clause of (1a), (1b) and (1c), entails the clausal presupposition in (1d) and thus, Karttunen argues, the sentences in (1a), (1b) and (1c), as a whole, do not presuppose anything. However, after the utterance of the sentences in (1a), (1b) and (1c), a hearer who does not know anything about Mormons will probably infer and accommodate the generalization in (1f), which I maintain is the presupposition of each of these sentences. The following examples are from Karttunen:

(1) a. Geraldine is a Mormon (ϕ) and she has given up wearing her holy underwear! (ψπ)
b. If Geraldine is a Mormon (ϕ), then she has given up wearing her holy underwear (ψπ)c. Either Geraldine is not a Mormon (¬ϕ) or she has given up wearing her holy underwear (ψπ)d. Geraldine has worn holy underwear (π)
e. If Geraldine is a Mormon (ϕ), then she has worn holy underwear (π)
f. ∼Mormons wear holy underwear

One of the main differences between the presupposition in (1f) and the clausal presupposition that π in (1d) is that (1f), unlike π, is not entailed by the second clause (ψπ) considered in isolation. In general, a characteristic feature of the type of presupposition under discussion is that it is not entailed by the declarative form of the clause that contains the presuppositional trigger (in the case at hand, the aspectual verb give up), considered in isolation. It is probably this fact that led Karttunen not to consider (1f) as a presupposition.

Karttunen (1973) redefines his filtering conditions so that they can account for the type of sentence in the examples above. Before the redefinition, Karttunen’s filtering conditions predict that if the presupposition that π, carried by the second clause (ψπ), is entailed by the first clause (ϕ), the sentence as a whole does not presuppose anything; that is to say, the presupposition that π is ‘filtered out’. However, in the sentences above, π is not entailed by ϕ and thus, Karttunen’s conditions, as they stood before the redefinition, could not ‘filter’ π, which would project. Nonetheless, π does not project in (1b) or (1c), nor is it an inference of (1b) or (1c). So, in order to ‘filter’ π, Karttunen considers that there is a certain set of ‘assumed facts’ X, to which (1f) belongs, which together with ϕ entails π ((X ∪ ϕ) |= π). The case in (1a) is more involved. Karttunen’s redefined filtering conditions can ‘filter’ π in its status as presupposition keeping it from becoming a sentential presupposition in (1a). However, π in (1a) is an entailment of the whole sentence and thus, the hearer infers that π, without π being asserted in the first clause ( unlike what happens in cases where there is a symmetric entailment between ϕ and π). Therefore, π in its status as entailment is not ‘filtered’ at all in the conjunction in (1a).

I would like to make some comments in regard to the so-called set of ‘assumed facts’ and the presumption that (1f) belongs to it. All presuppositions are ‘assumed facts’ or, at least, the speaker acts as if they were. So this in itself would not rule out that (1f) might be a presupposition. It might even be that the hearer shared the presupposition in (1f) with the speaker before the speaker uttered any of the sentences in (1a),
(1b) or (1c). Once again, this in itself would not rule out that (1f) might be a presupposition since, in normal conversation, there are many examples of presuppositions which do not need to be accommodated by the hearer. However, what demonstrates that (1f) is, in fact, a presupposition of (1a), (1b) and (1c) is that, in most cases, the hearer will be completely ignorant with respect to (1f) before (1a), (1b) or (1c) are uttered but, nonetheless, s/he will infer that (1f) and, what is crucial, s/he will accommodate (1f) as if it were one of his or her previous assumptions. The reason for this is that, if (1f) were not entailed by the context, (1a), (1b) and (1c) would not be interpretable on the intended reading. By ‘context’ I understand the context set of the conversation in the sense of Stalnaker (1978), i.e. the set of propositions towards which all the participants in the conversation show a disposition to act as if they were true (regardless of whether the participants in the conversation believe, in fact, that these propositions are true) and recognize the same disposition in the other participants in the conversation.

As was mentioned in the introduction, more recently, some researchers (Beaver 2001, Schlenker 2010) have addressed the phenomenon, which has been particularly studied in conditional and disjunctive sentences. However, for Beaver and Schlenker, compound sentences such as those in (1a), (1b) and (1c) have conditional presuppositions in the same way as any other compound sentence that carries a presupposition in the second clause would have a conditional presupposition. That is to say, they endorse Karttunen & Peters’ (1979) prediction, according to which, the compound sentences in the examples above would presuppose the material implication $\phi \rightarrow \pi$, which is considered the conditional ‘semantic presupposition’ of the sentence. Their reasoning goes as follows: the material implication is only accommodated as a whole in cases where the antecedent is relevant to the consequent, as would be the case in the examples in (1). If, by contrast, the antecedent is not relevant to the consequent, as happens in many other cases, it is only the consequent that is accommodated by the hearer; that is why, in these other cases, the conditional presuppositions are not intuitively grasped.

On this view, the concept of presupposition becomes a theoretical construct which, as such, is neither accessible to intuition in most cases nor testable; that is, it is neither possible to prove nor disprove that the compound sentences under discussion have ‘semantic presuppositions’, which are sometimes strengthened (by whatever mechanism) and sometimes accommodated as a whole. Therefore, it is necessary to find an explanation as to why, sometimes, compound sentences presuppose what I will call, for the time being, generalizations. So, I will start by putting forward a hypothesis for the process of inference and accommodation of this type of presupposition.

3 What Triggers the Inference?

What characterizes compound sentences that presuppose generalizations is that, in these sentences, the clausal presupposition neither projects nor is neutralized (i.e. asserted or put into question in the first clause); so, it is conditionalized. By the latter, I mean that the first clause and the presuppositional sentence, i.e. the sentence that expresses the clausal presupposition, stand in a relation of sufficient condition in the sense that the truth of the presuppositional sentence is only guaranteed if the first clause is true. That is to say, we do not know what the truth-value of the presuppositional sentence is, but we know that, if the first clause is true, the presuppositional sentence is true. This results in a very particular state of affairs since, normally, the clausal presupposition projects and it is the first clause and the non-presuppositional part of the second clause that stand in this sufficient condition relation. Nonetheless, in conjunctions, this is not exactly so: it
is possible to reproduce the *sufficient condition* relation\(^1\) between the first clause and the presuppositional sentence in a certain class of conjunctions (i.e. the counterparts to the conditional and disjunctive sentences being discussed in this article), so that the utterance of the conjunction would not make much sense unless the proposition expressed by the first clause is interpreted as a guarantee for the proposition expressed by the presuppositional sentence. However, in conjunctions, the presuppositional sentence is also an entailment of the whole sentence and thus, its truth value is always guaranteed.

It is in fact the hearer’s realization of the particular state of affairs described above that triggers the inference of the generalization for, without the generalization, it would be very difficult to interpret the first clause as a sufficient condition for the presuppositional sentence. In cases where the presuppositional sentence asymmetrically entails the first clause, this is the only interpretation available for, if the clausal presupposition projected, the first clause would be either redundant (in conjunctions) or nonsensical (in conditionals and disjunctions) and thus, the sentence could not be felicitously uttered in any context. However, in the absence of asymmetric entailment, all sentences that presuppose generalizations have an additional reading on which the presupposition projects and the first clause is a sufficient condition for the non-presuppositional part of the second clause. In some of these cases, both interpretations are, in principle, possible and thus, without further constraints on the context, the hearer gets both of them. By contrast, in other cases, the hearer rules out the interpretation on which the clausal presupposition projects; this is not because the projection of the clausal presupposition would make the first clause either redundant or nonsensical (it would not) but because, if the clausal presupposition projected, the first clause of the resulting (presupposition-free) sentence could not be interpreted as a sufficient condition for the non-presuppositional part of the second clause in any realistic context.

I will divide the discussion into three parts: In the remaining of this section, I will discuss cases where there is an additional interpretation but it is discarded. In the next section, I will address cases in which the presuppositional sentence asymmetrically entails the first clause and thus, no additional reading is possible. Finally, I will discuss cases where, in principle, both readings are possible. This arrangement is not random; as we will see, the concept of ‘generalization’ and the process by which generalizations are inferred and accommodated are much more easily grasped in cases where there is an additional interpretation which, assuming a realistic context, must be ruled out. These cases crucially involve aspectual verbs and thus, allow for readings on which it is just the presuppositional part of the second clause that is conditionalized, whereas the non-presuppositional part holds unconditionally. Once these cases have been understood, it is easier to realize that sentences in which there is an asymmetric entailment presuppose generalizations for, in them, the sentences have been stripped of the reading on which the clausal presupposition projects. I will leave until last those cases where, in principle, both readings are possible for two reasons: (i) in them, it is not a generalization (or general statement) that is presupposed but an attributive statement, and (ii) they constitute a very peculiar type of sentence, the so-called *McCawley*-sentences which, arguably, are not the most representative instances of the phenomenon.

In the following, I will focus on conditional sentences and it will not be until section 6 that I will show how the analysis may be extended to disjunctions and, with further adjustments, to conjunctions. The reason is that my argument hinges on the relation of *sufficient condition* and, though this relation may be extended to other types of compound sentence, the discussion will gain clarity if I focus first on conditional

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\(^1\)I am using the term ‘relation’ as in Asher & Lascarides (2003): any two propositions are arguments to the relation that holds between them. However, Asher & Lascarides do not address the issue in compound sentences.
sentences. So, let us start with the first type of cases I mentioned above. As I said before, they involve aspectual verbs as presuppositional triggers in the consequent, which results in readings on which what holds unconditionally is the non-presuppositional part of the consequent. We might say that, in these cases, it is the non-presuppositional part of the consequent that ‘projects’ out of the conditional, as we will presently see. The sentence in (2a) is similar to Karttunen’s example in (1b) and carries the presupposition in (2d):

\[(2) \quad a. \quad \text{If John is a Catholic (φ), then he has stopped going to Mass (ψ),}\]
\[b. \quad \text{John went to Mass (π)}\]
\[c. \quad \text{If John is a Catholic (φ), then he went to Mass (π)}\]
\[d. \quad \sim \text{Catholics go to Mass}\]

There are two ways of interpreting (2a). It all depends on what is conditionalized in the consequent: the presuppositional part of the clause (John’s having gone to Mass in the past) or the non-presuppositional part (John’s not going to Mass at the present time). If what is conditionalized is the presuppositional part, but not the non-presuppositional part, then the sentence conveys the information that John does not go to Mass at the present time and that, if John is a Catholic, he went to Mass in the past and thus, he has stopped going. As the presupposition that John went to Mass is conditionalized, it does not project; that is, John’s having gone to Mass and thus, John’s stopping going to Mass, are only guaranteed if John is a Catholic. If John is not a Catholic, it may be that he went to Mass in the past and thus, he has stopped going, but it may also be that he never went to Mass and thus, he has not stopped going. If the sentence is interpreted this way, John’s being a Catholic guarantees (is a sufficient condition for) both John’s having gone to Mass and John’s stopping going to Mass. But this strongly suggests that Catholics go to Mass at some time in their life (after all, John might be a Catholic who does not go anymore). The sentence might be paraphrased as follows: John does not go to Mass; so, if he is a Catholic, he has stopped going.

Now, if what is conditionalized is the non-presuppositional part, but not the presuppositional part, then the sentence conveys the information that John went to Mass in the past and that, if John is a Catholic, he does not go to Mass at the present time. As the presupposition that John went to Mass is not conditionalized, it does project. If the sentence is interpreted this way, John’s being a Catholic guarantees (is a sufficient condition for) John’s not going to Mass at the present time and thus, John’s stopping going to Mass. For that, we do not need any generalization about Catholics but a context in which being a Catholic would be a sufficient condition for someone’s not going to Mass. For instance, imagine a context where going to Mass were something that many people do and many other people do not do, regardless of their religion (or lack of). Now imagine that the Catholics start thinking that Mass has lost its meaning and decide not to go anymore. In this context, being a Catholic would ensure not going to Mass. The sentence might be paraphrased as follows: John went to Mass but, if he is a Catholic, he does not go anymore (he has stopped going).

Assuming a realistic context, the sentence in (2a) takes the first interpretation. For that, the hearer does not need to know anything about Catholic practices; s/he only needs to know that the words Catholic and Mass are both religion-related. If that is the case, it is very likely that the hearer will interpret John’s being a Catholic as a sufficient condition for John’s having gone to Mass (the presuppositional part of the consequent) and not for John’s not going to Mass (the non-presuppositional part of the consequent). In the same fashion, in Karttunen’s example in (1b), all that is required is to know that the words Mormon and holy are both religion-related, but nothing about Mormons’ dressing habits or Mormon practices. So, when
it comes to inferring the generalization, ‘world knowledge’ plays a very small role, if any at all. It is the interpretation of \( \phi \) as a guarantee (a sufficient condition) for \( \pi \) that triggers the process.

In (2c), \( \phi \) is a sufficient condition for \( \pi \) if every individual who instantiates the property expressed by the predicate in \( \phi \) (being a Catholic) also instantiates the property expressed by the predicate in \( \pi \) (going to Mass) at some time \( t \):

\[
\forall x (P_\phi(x) \rightarrow \exists t (Q_\pi(x), t))
\]

where \( x \) is an object, \( t \) is a time interval, \( P_\phi \) is the property expressed by the predicate in \( \phi \) and \( Q_\pi \) is the property expressed by the predicate in \( \pi \).

Note that (2c) does not entail but strongly suggests that (2d) is the case. For instance, John’s being a Catholic might be a sufficient condition for John’s going to Mass in the past because all Catholics in John’s family go to Mass, and not because all Catholics go to Mass. However, without further information, someone who hears (2a) and arrives at (2c) will reasonably infer that (2d) is the case. I am using Stalnaker’s (1975) notion of reasonable inference as a conclusion to which someone commits himself if he accepts a given premise. In the case under discussion, without further information, someone who accepts (2c) commits himself to (2d).

### 4 Asymmetric Entailment

The second class of sentences of the form if \( \phi \), then \( \psi \) \( \pi \) that also presuppose a generalization are characterized by the fact that the presuppositional sentence (\( \pi \)) asymmetrically entails the first clause (\( \phi \)). In these cases, the clausal presupposition that \( \pi \) does not project nor is overridden by the inference of ignorance with respect to the truth-value of \( \phi \); so, as before, \( \pi \) is conditionalized, in the sense that the truth of \( \pi \) is only guaranteed if \( \phi \) holds (i.e. \( \phi \) is a sufficient condition for \( \pi \)). But, unlike before, now \( \pi \) asymmetrically entails \( \phi \); so, \( \pi \) is also conditionalized in the sense that \( \pi \) can only be true if \( \phi \) is true (i.e. \( \phi \) is a necessary condition for \( \pi \)). However, it is the fact that \( \phi \) is a sufficient condition for \( \pi \) that triggers the generalization. Examples of asymmetric entailment of \( \phi \) by \( \pi \) constitute genuine counterexamples to Gazdar’s (1979) theory and thus, the literature (Heim 1990, Beaver 2001) abounds in them.

As was mentioned above, in these cases, the sentence does not have an additional reading on which the clausal presupposition projects. As the presuppositional sentence asymmetrically entails the first clause, if the presupposition projected, it would be entailed by the global context, but then putting into question the truth of the first clause would be nonsensical. For instance, if after the utterance of (4a) (adapted from Beaver 1997), the clausal presupposition that David wrote the article whilst blindfolded (4b) projected, the global context would entail that David wrote the article whilst blindfolded and thus, it would make no sense to put into question whether David wrote the article in the if-clause of the conditional:

\[
(4) \quad \begin{align*}
\text{a.} & \quad \text{If David wrote the article (} \phi \text{), then the editors will realize that he did it whilst blindfolded (} \psi_\pi \text{)} \\
\text{b.} & \quad \text{David wrote the article whilst blindfolded (} \pi \text{)} \\
\text{c.} & \quad \text{If David wrote the article (} \phi \text{), he did it whilst blindfolded (} \pi \text{)} \\
\text{d.} & \quad \neg \text{David writes his articles whilst blindfolded}
\end{align*}
\]
I have explained why the presupposition that π does not project but I have not explained yet why it is not overridden by the ignorance with respect to the truth-value of φ. As a matter of fact, questioning the truth of φ (David wrote the article) amounts to questioning the truth of π (David wrote the article whilst blindfolded). This is why Gazdar would predict that the clausal presupposition is overridden by the inference (on the part of the hearer) of ignorance (on the part of the speaker) with respect to the truth value of the first clause. However, the clausal presupposition is not overridden by this inference, unlike what would happen if the entailment were symmetric. The difference lies in the fact that, if the entailment were symmetric, the presuppositional sentence would be duplicated in the antecedent and thus, assuming that the conditional sentence were genuinely hypothetical, the truth of the presuppositional sentence would be put into question, and that would be the end of the story. By contrast, if the entailment is asymmetric (π asymmetrically entails φ), as happens in (4a), the presuppositional sentence is not duplicated in the antecedent; thus, though we do not know the truth-value of π, at least we know that if φ is true, π is true, so that π survives in the consequent of the sentence. However, surviving in the consequent amounts to be conditionalized. So, the hearer arrives at the conditional inference in (4c) and, in order to interpret φ as a sufficient condition for π, s/he infers the generalization in (4d) and accommodates it as if it were one of his previous assumptions. As before, (4c) does not entail but strongly suggests (4d). For instance, φ might be a sufficient condition for π in (4c) because David spent the day he wrote the article with a blindfold covering his eyes and not because, in general, he writes his articles whilst blindfolded. However, without further information, someone who hears (4a) and arrives at (4c) will reasonably infer that (4d) is the case.

In order to give form to the generalization in this case, I will adopt Kim’s (1976) notation: the state or event described in the first clause (φ) is represented as (x, P_φ, t) and the state or event described in the presuppositional sentence (π) is represented as (x, Q_π, t). For Kim, states and events are “exemplifications by substances [objects] of properties at a time [or time interval]” (1976: 311). So, we have the following entailment:

\[ \forall t ((d, P_\phi, t) \rightarrow (d, Q_\pi, t)), \text{ where } d \text{ stands for ‘David’}. \]

That is, for every t, if David instantiates property P_φ at time t, then David instantiates property Q_π at time t.

The next example, from Heim (1990), illustrates a case of asymmetric entailment in a conditional sentence that cannot be appropriately uttered in any ‘normal’ context. As Heim notes, the sentence is odd because its presupposition is odd. For Heim, the presupposition would be the material implication in (6c). Note that the implication in (6c) is odd because interpreting φ as a sufficient condition for π leads to the false generalization in (6d) (or something along the lines of (6d)):

\[ 6a. \quad \# \text{ If John has children } (\phi), \text{ he’ll bring his 4-year-old daughter } (\psi_\pi) \]
\[ 6b. \quad \text{John has a 4-year-old daughter } (\pi) \]
\[ 6c. \quad \text{If John has children } (\phi), \text{ he has a 4-year-old daughter } (\pi) \]
\[ 6d. \quad \leadsto \text{People with children have 4-year-old daughters} \]

Once again, the clausal presupposition that π does not project since the presuppositional sentence (π) in (6b) entails φ, i.e. the antecedent of the conditional sentence in (6a). So π is conditionalized and, as a result, the hearer infers (6c); however, (6c) leads to the false generalization in (6d). Of course, we may enrich the
context to the point where it seems as if the sentence in (6a) is acceptable but, as we will presently see, this is just a trick. For instance, we can imagine a (quite peculiar) context where one of my cousins has a 4-year-old daughter and the rest of my cousins do not have any children; we are talking about my cousins and someone has heard that one of them has a 4-year-old daughter and asks me who will bring his 4-year-old daughter; I do not remember who has a 4-year-old daughter, but I remember that only one of my cousins has children. In this context, I might utter the sentence in (6a) and my audience would not infer the generalization in (6d). However, I would be referring to an actual discourse referent, i.e. the daughter of one of my cousins, by means of a hypothetical discourse reference, i.e. John’s hypothetical daughter. Heim (2006) provides other examples of this particular type of context enrichment.

Finally, note that the conjunctive counterpart to (6a) (*John has children and he’ll bring his 4-year-old daughter*) is perfectly acceptable. The difference in acceptability lies in the fact that the proposition that \( \phi \) and the proposition that \( \pi \) do not lend themselves to be the arguments of a *sufficient condition* relation. However, if this relation is forced upon them, as is the case in the conditional sentence in (6a), the resulting sentence is infelicitous. By contrast, the relation may be avoided and thus, it is avoided in the conjunctive counterpart to (6a). That is to say, in the conjunction, \( \phi \) and \( \pi \) stand in a relation other than guarantee and thus, the sentence is acceptable. I will come back to this point in section 6.

5 *McCawley*-sentences

As noted by Beaver (2001), the so-called *McCawley*-sentences (attributed by Karttunen (1973) to James McCawley), such as that in the example in (7a), also give rise to conditional inferences. *McCawley*-sentences always have two possible interpretations. On one interpretation, the presupposition carried by the consequent projects; on this interpretation, the sentence in (7a) (in Karttunen 1973) presupposes (7b). On the other interpretation, the presupposition carried by the consequent does not project and the hearer accommodates the presupposition in (7d):

\[
\begin{align*}
(7) & \\
& \text{a. If Nixon invites Angela Davis to the Whitehouse (}\phi\text{), he will regret having invited a black militant to his residence (}\psi_\pi\text{)}  \\
& \text{b. } \lnot \text{Nixon has invited a black militant to his residence (}\pi\text{)}  \\
& \text{c. If Nixon invites Angela Davis to the Whitehouse (}\phi\text{), he will have invited a black militant to his residence (}\pi\text{)}  \\
& \text{d. } \lnot \text{Angela Davis is a black militant}
\end{align*}
\]

As in the example in (2a) in section 3, there are two ways of interpreting the sentence above. It all depends on what is conditionalized in the consequent: the non-presuppositional part of the clause (Nixon’s regretting having invited a black militant to his residence) or both the presuppositional and the non-presuppositional part (Nixon’s having invited a black militant to his residence and Nixon’s regretting having invited a black militant to his residence). If what is conditionalized is just the non-presuppositional part, then the sentence conveys the information that Nixon has invited a black militant to his residence and that, if Nixon invites Angela Davis, he will regret having invited a black militant. The presupposition that Nixon has invited a black militant to his residence holds unconditionally, i.e. projects. If the sentence is interpreted this way, Nixon’s inviting Angela Davis guarantees (is a sufficient condition for) Nixon’s regretting having invited a black militant to his residence. So we need a context in which, for whatever reason,
having Angela Davis and a black militant in the Whitehouse at the same time will result in a disadvantageous situation for Nixon.

If, by contrast, both the presuppositional and the non-presuppositional part of the consequent are conditionalized, then Nixon’s having invited Angela Davis guarantees (is a sufficient condition for) both Nixon’s having invited a black militant to his residence and Nixon’s regretting having invited a black militant to his residence. The presupposition that Nixon has invited a black militant to his residence is conditionalized and thus, does not project; that is, Nixon’s having invited a black militant to his residence is only guaranteed if Nixon invites Angela Davis to his residence. This strongly suggests that Angela Davis is a black militant that Nixon has invited to his residence.

However, it has been argued (Gazdar (1979), van der Sandt (p.c.)) that (7c) arises just as a result of some sort of anaphoric link between Angela Davis and a black militant. Let us illustrate this objection with an example. In the mini-discourse in (8), there is no presuppositional trigger involved and, yet, the most plausible interpretation is that on which Angela Davis is linked to a black militant even if the hearer does not know in advance who Angela Davis is. That is to say, the mini-discourse in (8) strongly suggests that (7d) is the case; however, (7d) is not a presupposition of (8):

(8) Nixon has invited Angela Davis to a disarmament meeting. It will be the first time that a black militant will attend a disarmament meeting.

The fact that the hearer establishes links between discourse referents in non-presuppositional environments does not invalidate the presuppositional status of (7d). Note that, once the hearer arrives at (7c), we have a similar situation as that in (8): a presupposition-free environment. However, my argument is that (7d) is a presupposition of (7a), not of (7c). In order to make sense out of (7c), the hearer establishes a link between both discourse referents; otherwise, it would be very difficult to interpret φ as a sufficient condition for π in (7c). Something similar happens in (8); for this discourse to be maximally coherent, the hearer establishes a link between both discourse referents. The crucial difference between (7c) and (8) is that (7c) results from the conditionalization of a clausal presupposition, whereas (8) does not. Now, if the link were established upon the utterance of the sentence in (7a), the hearer would not get the first interpretation, on which the clausal presupposition projects. However, the hearer gets both interpretations.

This begs the question: why does the hearer get two different interpretations which are both plausible? Presuppositions tend to be globally accommodated, not conditionalized. In the two preceding sections, the conditionalization was justified because projection would have resulted in the sentence being either downright infelicitous (4a) or infelicitous in a realistic context (2a). However, this is not the case with (7a), which has a plausible reading on which the clausal presupposition projects. In cases where the hearer only gets the second interpretation, this suggests that the clausal presupposition that Nixon has invited a black militant is difficult to accommodate. This would be the case if the hearer knew that Nixon was not likely to invite black militants to the Whitehouse. But a hearer who is not familiar with Nixon’s politics would not rule out the first reading but would be open to both interpretations.

Finally, in relation to the data analysed in the last three sections, the question arises as to why there cannot be an interpretation of (4a) and (7a) on which, as happened in (2a), the presupposition of the consequent is conditionalized but not the non-presuppositional part. The explanation lies in the difference between presuppositional triggers. Aspectual verbs such as stop mark a turning point in time, so that we have a former state of affairs, a turning point and a subsequent state of affairs. If we put into question the former state of
affairs (expressed by the presupposition), we are also putting into question whether there has been a turning point (expressed by the clause that contains the trigger); however, it may be that the state of affairs that would follow the turning point (if there had been one) holds even though there has not been a turning point. By contrast, with factive verbs such as realize and regret, if we put into question the state of affairs expressed by the presuppositional sentence, we are putting into question the state of affairs expressed by the clause that contains the presuppositional trigger and, this time, there is no additional state of affairs that might still hold true.

6 Extensions

I said above that the analysis of conditional sentences is extendable to disjunctions and conjunctions. The extension to disjunctions is straightforward if we adopt the material implication interpretation of the conditional. If, instead, we adopt the Stalnaker conditional, Stalnaker (1975) himself demonstrates that, given either \( \neg \phi \) or \( \psi \) and \( \pi \), it is reasonable to infer that if \( \phi \), then \( \psi \). So, in cases where a generalization is inferred, \( \phi \) and \( \pi \) stand in the same relation in the disjunction as that in which they stand in its conditional counterpart, i.e. \( \phi \) is a sufficient condition for \( \pi \).

As for conjunctions, in section 3, I already put forward the idea that \( \phi \) and \( \pi \) stand in a counterpart relation to that in which they stand in the corresponding conditional sentence and I called this relation guarantee. The sentences in (9a), (10a) and (11a) below are the conjunctive counterparts to the conditional sentences in (2a), (4a) and (7a):

(9)  a. John is a Catholic (\( \phi \)) and he has stopped going to Mass (\( \psi \))
    b. John went to Mass (\( \pi \))
    c. Guarantee ([ John is a Catholic (\( \phi \)) ], [ John went to Mass (\( \pi \)) ])
    d. \( \neg \) Catholics go to Mass

(10) a. David wrote the article (\( \phi \)) and the editors will realize that he did it whilst blindfolded (\( \psi \))
    b. David wrote the article whilst blindfolded (\( \pi \))
    c. Guarantee ([ David wrote the article (\( \phi \)) ], [ David wrote the article whilst blindfolded (\( \pi \)) ])
    d. \( \neg \) David writes his articles whilst blindfolded

(11) a. Nixon has invited Angela Davis to the Whitehouse (\( \phi \)) and he will regret having invited a black militant to his residence (\( \psi \))
    b. Nixon has invited a black militant to his residence (\( \pi \))
    c. Guarantee ([ Nixon has invited Angela Davis to the Whitehouse (\( \phi \)) ], [ Nixon has invited a black militant to his residence (\( \pi \)) ])
    d. \( \neg \) Angela Davis is a black militant

The process whereby the hearer arrives at (9c), (10c) and (11c) is very similar to that by which s/he arrives at (2c), (4c) and (7c). In order to maximize sentence-internal coherence, \( \phi \) and \( \psi \) should be in some kind of relationship. Most frequently we find that \( \phi \) and the non-presuppositional part of \( \psi \) relate to each other and \( \pi \) projects. However, as happened with the conditional sentences in (2a) and (4a), if the
clausal presupposition projected in (9a) and (10a), the resulting sentences would be either inappropriate in all realistic contexts (9a), or inappropriate in all contexts (10a). In (9a), if the presupposition that John went to Mass projected, the hearer would try to establish coherence by relating John’s being a Catholic to John’s not going to Mass; however, no realistic context would admit the sentence on this interpretation, which could be paraphrased as follows: John went to Mass but he is a Catholic and does not go to Mass anymore. What we want to obtain is the opposite interpretation, on which the clausal presupposition does not project: John does not go to Mass anymore but he is a Catholic and went to Mass. As for (10a), if the presupposition that David wrote the article whilst blindfolded projected, the assertion that David wrote the article would be redundant. By contrast, as happened with the conditional sentence in (7a), the sentence in (11a) has two interpretations; the presupposition that Nixon has invited a black militant can project and, still, the hearer can establish coherence relating Nixon’s having invited Angela Davis and Nixon’s regretting having invited a black militant (as, in this case, the hearer would not know who Angela Davis is, s/he might think that, perhaps, Angela Davis does not like black militants). However, I will focus on the second interpretation on which the clausal presupposition does not project.

As π, in its status as presupposition, does not project, φ and π stand in a similar relation to that in which they stand in the corresponding conditional sentence: φ guarantees π. This is represented in (9c), (10c) and (11c). However, as I remarked in section 3, the fact that φ and π stand in a guarantee relation does not imply that the truth of π is only guaranteed if φ is true. Unlike what happens in conditionals and disjunctions, in conjunctions, π is an entailment of the whole sentence and thus, assuming that the sentence is true, π is also true. Not only π is entailed by the whole sentences in the examples above but also φ. What is more, φ is asserted. So, in these cases, there is no intermediate conditional inference, unlike what happened with the conditional sentences; that is to say, (2c), (4c) and (7c) do not obtain. The explanation is simple: a sentence cannot have the presupposition that if φ, then π and, at the same time, assert that φ. Nonetheless, φ and π stand in a guarantee relation in the following sense: if φ and π were not entailments of the whole sentence, the truth of π would be only guaranteed if φ were true. This is reflected in the fact that the generalization, which the hearer infers in order to interpret the relation between φ and π, may be expressed as an implication. Let us take (9a): the proposition that John is Catholic is asserted and thus, it would make no sense to argue that the sentence presupposes that if John is a Catholic, he went to Mass. However, if the hearer infers that both propositions stand in a guarantee relation, s/he will arrive at the generalization that Catholics go to Mass and, from it, it follows that if Mary is a Catholic, she goes to Mass, that if Tom is a Catholic, he goes to Mass, . . . ; that is, if someone is a Catholic, s/he goes to Mass. But, in (9a), it is asserted that John is a Catholic.

Once the crucial statement is globally accommodated, π follows from it together with φ. This idea is already present in Karttunen (1973), as we saw in section 2; the difference is that Karttunen considers that the generalization is an ‘assumed fact’, which the hearer does not need to infer nor accommodate. It might be argued that, since the conditional inferences in (2c), (4c) and (7c) are weaker than the statements in (2d), (4d) and (7d), it is the conditional inferences in (2c), (4c) and (7c) that the sentences in (2a), (4a) and (7a) presuppose, and that the statements in (2d), (4d) and (7d) are just further inferences. Understanding presuppositions as conditions that sentences impose on their contexts of utterance, it would be reasonable to identify the weakest proposition that the context must entail so that the sentence may be feliciously uttered with the presupposition of the sentence; that is to say, the sentence will be felicitous as soon as the minimum requirement is fulfilled. Of course, I am referring to the weakest proposition that makes sense, as happens
to be the case in (2c), (4c) and (7c). However, if the conditional inferences were, in fact, the presuppositions of the corresponding conditional sentences, the analysis could not be extended to conjunctions for it would result in fully counterintuitive predictions for them. Furthermore, if we maintain that the statements in (2d)=(9d), (4d)=(10d) and (7d)=(11d) are the presuppositions of the conditional sentences in (2a), (4a) and (7a), the conditional inferences in (2c), (4c) and (7c) follow from the statements, and the same holds for the disjunctive counterparts to (2a), (4a) and (7a). In a similar way, the clausal presuppositions in (9b), (10b) and (11b) follow from the statements taken together with the first clauses of (9a), (10a) and (11a), respectively. If, by contrast, we argued that the conditional inferences in (2c), (4c) and (7c) are the presuppositions of the sentences in (2a), (4a) and (7a), and of their disjunctive and conjunctive counterparts, the question would remain why the statements in (2d)=(9d), (4d)=(10d) and (7d)=(11d) are felt to be necessary so that the conditional sentences in (2a), (4a) and (7a) as well as their conjunctive counterparts in (9a), (10a) and (11a) may be interpreted on the intended reading.

Finally, in section 4, I said that I will come back to the the conjunctive counterpart to (6a), given in (12a) below which, unlike (6a), is perfectly acceptable:

(12)  
   a. # John has children (φ) and he will bring his 4-year-old daughter (ψπ)  
   b. John has a 4-year-old daughter (π)  
   c. Guarantee ([John has children (φ)], [ John has a 4-year-old daughter (π) ])

In (12a), the clausal presupposition that π, in (12b), does not project; if it projected, the assertion of φ would be redundant. As I argued above, if the clausal presupposition does not project, φ and π are usually the arguments to a guarantee relation. However, the conditional sentence in (6a) was infelicitous precisely because φ and π were forced to be the arguments to a sufficient condition relation. But, whereas in a conditional sentence, there is no other choice, in a conjunctive sentence, the two clauses may stand in a different relation. As the meaning of guarantee is that, if φ and π were not entailments of the whole sentence, φ and π would stand in a sufficient condition relation, in cases where the corresponding sufficient condition relation leads to infelicity, guarantee does not obtain. This is what happens in (12c).

I would like to finish this section with a comment on another issue, which is also raised by the sentence in (12a) and, though not directly related to generalizations, bears on the subject of asymmetric entailment. The sentence in (12a) does not presuppose but entails that John has a 4-year-old daughter (π). If it did presuppose π, the assertion that John has children (φ) would be redundant and this would make the sentence infelicitous. Nonetheless, the sentence is felicitous and, furthermore, the hearer infers that John has a 4-year-old daughter. It might be argued that once φ has been asserted, we have an updated context set, let us call it C′, and it is in C′ that the information that John has a 4-year-old daughter is accommodated. I say ‘accommodated’ and not ‘satisfied’ since C′ entails that John has children but not that he has a 4-year-old daughter. However, this explanation is not plausible since information which is not hypothetical should be globally accommodated. That is to say, if after the utterance of (12a), the hearer accommodated π, s/he would act as if π had been entailed not only by C′ but also by C (or whatever the context set was at the beginning of the conversation). Therefore, π is not presupposed by the whole sentence but entailed by it. This is in accordance with the nature of the sentence, which is totally informative; that is, the speaker does not expect that the hearer will accommodate the information that John has a 4-year-old daughter as if it were one of his or her previous assumptions; if that were the case, the speaker would not have asserted that John has children.


7 Summary

So far in the literature, sentences that presuppose what has been dubbed as ‘conditional presuppositions’ have been explained as cases where the conditional ‘semantic presupposition’ is not strengthened owing to the fact that the antecedent is relevant to the consequent. I have presented a hypothesis for conditional sentences according to which, what triggers the inference is that the clausal presupposition does not project nor is neutralized; so, it is conditionalized. As a result, the hearer must interpret the first clause as a sufficient condition for the presuppositional sentence; but, for that, it is reasonable to infer that a general statement or, in other cases, an attributive statement holds. I maintain that this statement, what I have called ‘generalization’ is globally accommodated by the hearer, so that the so-called ‘conditional presuppositions’ that arise in conditional and disjunctive sentences are just inferences that instantiate the generalization. This hypothesis has been straightforwardly extended to disjunctions and, with further adjustments, to conjunctions. I have argued that, in conjunctions, the hearer interprets the first conjunct as a guarantee for the presuppositional sentence and this is what triggers the inference and subsequent accommodation of the generalization. Once the generalization is globally accommodated, the clausal presupposition carried by the second conjunct follows from the generalization taken together with the first clause.

References


The notion of presupposition is definitely the most important notion that came into linguistics from logic. It has been used by linguists of various frameworks, theoretical schools and directions.

Semantic and pragmatic presuppositions

The history of presupposition begins with Strawson 1950, where it is said: P is a presupposition of S, if P must be true for S to be either true or false. In other words, if S has a false presupposition it can be neither true nor false – it is semantically deviant.

This definition predicts semantic deviance of, e.g., sentence (1), with a false presupposition ‘New York is the capital of the US’, and sentence (2) with the presupposition ‘Gödel occupies the lowest position on the scale of mathematicians’.

(1) John knows that New York is the capital of the US;
(2) Even Gödel could prove this theorem.

It is natural to assume that the intuition about semantic deviance is included in linguistic competence of the language bearer, and it is hardly plausible that (2) is “less deviant” than (1), as is suggested, e.g., in Karttunen 1974. If a question or request has a false presupposition the reaction to it would be, in the first place, a reaction towards the presupposition rather than an answer to the question or request. This can be demonstrated by a famous dialogue:

‘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.’ (L.Carroll. Alice’s adventures in Wonderland)

R.Stalnaker (1974) paved the way from the truth of presuppositions to projection under negation, and then linguists themselves found many other projection diagnostics for presuppositions: conditionals, question, modals, etc.

Stalnaker 1974 gave rise to a pragmatic definition of presupposition, based on the Common Ground condition (Karttunen 1974, Heim 1983). Now I argue that Stalnaker 1974 can be interpreted in a different way. In fact, Stalnaker suggested two definitions of presupposition.

Definition 1. Q is presupposed by an assertion that P if under normal conditions one can reasonably infer that a speaker believes that Q from either his assertion or denial that P.

This definition can be considered (ignoring the difference between denial and negation) as introducing a semantic notion of presupposition. Extensionally, it is equivalent (perhaps, with some reservations) to the definition contained in Strawson 1950.

Definition 2. Q is presupposed by P if the speaker assumes or believes that P and assumes or believes that his addressee assumes or believes that P and assumes or believes that his addressee recognizes that he makes such assumptions.

The difference between the two definitions consists in that in Definition 1 only the speaker’s beliefs are mentioned, while Definition 2 adds the familiarity of the addressee with the beliefs of the speaker. Definition 2 can be looked upon as Definition 1 with the condition of familiarity (of the addressee with the semantic presupposition) added.

Much of the linguistic literature over the past forty years makes use of Stalnaker’s Definition 2 only
and assumes that non-informativity is an obligatory property of presuppositions, distinguishing them from other types of implicit semantic components. (Some presuppositions that do not obey the familiarity condition were called conventional implicatures.) Now I argue that, instead, two different types of presupposition are to be recognized: (a) semantic presupposition simpliciter, and (b) semantic presupposition that obeys the familiarity condition. The latter can be tentatively called PRAGMATIC PRESUPPOSITION.

To take an example, the word only triggers a semantic presupposition. In fact, Only Lucy came is semantically deviant if Lucy didn’t come; and the implication ‘Lucy came’ projects into Not only Lucy came (example from Roberts 2006). But only doesn’t trigger a pragmatic presupposition: that Lucy came need not be KNOWN to the addressee. (In Paducheva 1981 Russian tol’ko ‘only’ is demonstrated to have a semantic but not pragmatic presupposition.)

The fact is that novelty or familiarity of a proposition can often be expressed separately, e.g., by prosodic means (which are studied in the Topic-Focus theory), see Schmerling 1971:

(3a) John didn’t know \ that there were wolves in this wood – [familiarity for the addressee];
(3b) John didn’t know / that there were wolves in this wood \ [novelty for the addressee].

In (3b) raising intonation cancels the presupposition of familiarity usually connected with know as a (semi)faactive verb; but the semantic presupposition is preserved.

The same effect can be demonstrated by the verb regret, which can be pronounced with two different accents and with the same meaning difference as in example (3):

(4a) I regret \ that he failed – ;
(4b) We regret / that your abstract is not accepted \ .

Note that for Russian sožalet’ ‘regret’ non-familiarity intonation and type of use is much less usual than for English regret, so this prosodic device is language dependent and lexically conditioned.

Thus, my first point is that two varieties of presuppositions should be distinguished, semantic and pragmatic ones, familiarity (non-informativity) being a separate parameter. What follows from this observation is that the pragmatic definition of presupposition, based on the Common Ground condition, should be fully adequate only for those presuppositions that are both semantic and pragmatic.

My second point concerns projection tests and, in the first place, projection under negation.

Projection tests

As is known, projection under negation was for some time used by linguists as a definition of presupposition. Later on it was realized that this simple (and “logically motivated”) definition doesn’t work for ALL cases of presupposition. Some evident presupposition-triggers fail to pass the projection under negation test: a sentence with the corresponding word or construction may have NO natural negation, i.e. negation expressed by a negative particle. Now, I argue that the very absence of a natural negation is linguistically significant: it says much about semantic structure of a sentence. There are two main reasons for a sentence with a presupposition-trigger to have no natural negation.

Reason 1. Take sentence Even Lucy came, with the presupposition-trigger even. It has no negation: the fact is that the meaning of even consists of nothing but a presupposition, so even can’t attract negation. And if we attach negation to the main verb (in order to negate the assertion) the presupposition introduced by even changes to the opposite, for it is construed on the basis of the assertion. So in order to preserve the presupposition under negation we have to part with even and look for what can be called its DUAL. Unfortunately, for even a dual cannot be found, so a sentence with even has no natural negation.
But a dual (i.e. something like an antonym) can be found for many other particles whose meaning is a presupposition (see Paducheva 2008). Examples from Russian:

– for užé ‘already’ it is ešče ‘still’: NOT (On užé vernulsja) = On ešče ne vernulsja;
– for snova ‘again’ it is na etot raz ‘this time’;
– for ešče raz ’once again’ it is bol’še ne ‘never more’;
– for too ‘also’ it is v otličie ot ‘as opposed to’;
– for xot’ by ‘at least’ it is daže ‘even’.

On the other hand, almost has no dual, and a sentence with almost has no negation, though almost is an obvious presupposition-trigger. Thus, the first source of absence of a natural negation is presuppositional meaning of the highest semantic operator in the sentence’s semantic structure.

Reason 2. A sentence may have no natural negation if there is more than one assertion in its semantic structure. Take Russian sentences (6a) and (6b).

(6a) Džon široko otkryl dver’ ‘John widely opened the door’;
(6b) Džon otkryl dver’ široko ‘John opened the door widely’.

Qualitative modifiers, such as široko, normally presuppose that the situation in question takes place, so ‘John opened the door’ seems to be a presupposition of both (6a) and (6b). But sentence (6b) has a negative counterpart Džon otkryl dver’ ne široko, with a negative particle before the asserted široko, while sentence (6a) has no natural negation: sentence Džon ne široko otkryl dver’ has a preferable phrasal accent on široko and is understood as negation of (6b), and not of (6a). The explanation is that sentence (6a), because of its word order and syntactic structure, has TWO ASSERTIONS: ‘John opened the door’ and ‘the door is opened widely’.

There are more simple examples of the same phenomenon. Sentences with such conjunctions as and or but have no natural negation – exactly because they contain two assertions; the negated meaning (containing a lot of disjunctions) is too indeterminate:

IT IS NOT THE CASE THAT (She is nasty but wise) ≈ ‘either she is not nasty, or not wise, or both’.

Thus, clearly, projection under negation is revealing both when it is possible and when it is not.

It is often stated that the most significant amount of current work in semantics and pragmatics of presuppositions is devoted to a proper understanding of when and how presuppositions project. Now I argue that it is no less important for semantic characterization of a sentence to reveal propositions that constitutes the SCOPE – of negation, modal, question or some other semantic operator in the sentence’s meaning representation. It is important for a linguist not only to reveal a presupposition, which escapes negation, but also to identify the assertion that accepts negation, i.e. constitutes its scope.

In Russian, presuppositions are at work when the question arises, where to put the negative particle in order to transform a sentence into its counterpart with a contradictory negation. As we have already seen, difficulties arise 1) when the main semantic operator of the sentence is non-assertive (namely, presuppositional in its nature, such as even) and 2) if a sentence includes more than one assertion. In both cases there is no single entity that can “shelter” the negative particle.

Presuppositions and lexical semantics

Negation interacts with the lexical semantics of a word. The role of presuppositions in this area was brilliantly demonstrated in Fillmore 1971 on the example of verbs accuse and criticize. To be on the safe side, I’ll take their Russian equivalents osuždat’ ‘criticize’ and obvinjat’ ‘accuse’. Slightly
simplifying, Fillmore’s idea was as follows. Both verbs contain in their semantic decomposition propositions ‘S is bad’ and ‘S takes place’. But in the semantic structure of osuždat’ ‘criticize’ ‘S takes place’ is a presupposition and ‘S is bad’ – an assertion, while in the semantic structure of obvinjat’ ‘accuse’, on the contrary, ‘S is bad’ is a presupposition and ‘S takes place’ is an assertion. Now let us look how these two Russian verbs behave under negation:

(7a) NOT (ja osuždaju \ Džona za konformizm) = Ja ne osuždaju \ Džona za konformizm;

(7b) NOT (ja obvinjaju Džona v konformizme \) = Ja obvinjaju Džona ne v konformizme \.

Sentential (i.e. preverbal) negation is possible for (7b), but it would be a SHIFTED negation (дучев 1974/2009: 147) – note that in (7b’) the negated word doesn’t coincide with the main stress bearer (as is usual for a negative sentence):

(7b”) NOT (ja obvinjaju Džona v konformizme \) = Ja ne obvinjaju Džona v konformizme \.

This is only one of innumerable examples of how presuppositions are at issue in determining the place of negation in Russian. In (7c) negation stands in a wrong place; one should say (7c‘):

(7c) *Glavnyj počtamt ne nachoditsja na Mjasnickoj ‘central post office is not on Mjasnickaja street’;

(7c’) Glavnyj počtamt nachoditsja ne na Mjasnickoj.

Different embedding contexts may have different effects on lexical presuppositions of a word.

Example 1 (on the basis of Лизьняк, Евтимин 1996, пресян 2010). The verb povezti, which in its impersonal use means ‘to be lucky’, has the following semantic decomposition:

-u povezlo s Y-om / čto Y ‘X is lucky with Y’ =

(i) ‘the event Y took place with’ [presupposition 1];

(ii) ‘the speaker believes that Y is not the result of X’s activity but just a concatenation of circumstances’ [presupposition 2];

(iii) ‘the speaker believes that Y is good for’ [assertion].

Example (8) demonstrates the influence of negation, namely, the distribution of the sentence meaning between presuppositions and assertions.

(8) Vam ne povezlo, čto vy malo vstrelili xorošix ljudej ‘you were unlucky in that you met very few worthy people’ is your life’ =

(i) ‘the event Y took place – you met very few worthy people’ [presupposition 1]

(ii) ‘Y is just a concatenation of circumstances, not the result of actions of X’ [presupposition 2]

(iii) ‘event Y is NOT good for’ [negated assertion].

Assertion is the unique semantic component that undergoes negation. But there are semantic
operators other than negation, and they affect presuppositions of the verb *povezti*:

(9) Džonu *prosto* povezlo = ‘the event is *purely* accidental for John’; *purely* acts upon component (ii), presupposition;

(10) Džonu *javno* povezlo = ‘the event is *obviously* accidental and *obviously* good for John; *obviously* acts upon component (ii), presupposition, and component (iii), assertion.

Note that *again* doesn’t act upon component (i), a presupposition; presupposition 1 remains intact in the context of (11); presupposition connected with *opjat* ‘again’ is: ‘another event Y’ took place, which is also good for X’.

(11) Džonu *opjat* povezlo ‘again John was lucky’.

Example (12) is of special interest; it demonstrates that negation can affect presupposition 1, which becomes the main assertion of the sentence and undergoes negation:

(12) Jemu ne povezlo rodit’sja *bogatym* = ‘event Y, namely, to have been born rich, which is good, did NOT occur to X’.

Thus, the property of being able to project should be studied separately for different presupposition triggers and different contexts. Projection problem is, basically, a problem of scope of semantic operators. Presupposition projection problem is, in the first place, the problem of identification of presuppositions of separate words and constructions, so that they undergo negation or constitute the scope of other semantic operators.

Presuppositions interact semantically with “ordinary meanings” and with each other and they might tell us much about the appropriate form of a theory of interpretation.

Presuppositions and conventional implicatures

The two Grice’s candidates for conventional implicature triggers, *but* and *therefore*, are rejected in Bach 1999. But there are other candidates. L.Horn (1989: 144–53) discusses non-truth-conditional aspects in the semantics of the verb *to manage*, widely discussed since Karttunen & Peters 1979. Sentence (13) is truth-conditionally equivalent to (14), though it is semantically different from (14); the difference is accounted for by a semantic component (16) ‘John made efforts to solve the problem’, which is present both in (13) and in its negation (15):

(13) John managed to solve the problem;
(14) John solved the problem;
(15) John didn’t manage to solve the problem;
(16) ‘John made efforts to solve the problem’.

The “conative” component (16) is called in Karttunen & Peters 1979 a conventional implicature, though it could have been also called a presupposition, for it is present both in (13) and in its negation. The difference between presuppositions and conventional implicatures is not paid attention to in this paper; what deserves attention is that the “conative” component is important not only for lexicon but also for grammar. In fact, in Russian the semantic opposition of Perfective vs. Imperfective aspect (for a group of verbs called conatives) consists in that semantics of a Perfective aspect form includes the “conative” component. Which fact becomes obvious in a negative context: Džon *ne rešil* [Pfv] *zadaču* has an implication ‘John made efforts to solve the problem’, Džon *ne rešal* [Ipfv] *zadaču* has no such implications, see Пресняк 1995: 59.
The speaker and other presupposition bearers

The first definition by Stalnaker mentions the speaker who believes that $Q$ both in his assertion or denial that $P$. Up till now the speaker was not mentioned. See below several examples demonstrating that at least in some cases the bearer of the presupposition should be made explicit in the semantic representation of a sentence. In fact, presupposition of the speaker may become a belief of the subject of propositional attitude, not the speaker.

Example 2. Sentence (a) *Even John passed the test* asserts that John passed the test and presupposes that John is among the least likely to have passed the test. But the meaning of *likely* is egocentric: *likely* demands the subject of the opinion. In a separate sentence it is the presupposition of the speaker that John is among the least likely to have passed the test. And we have to make it clear that it is the speaker’s presupposition – otherwise we won’t be able to give an account of the fact that in an embedded position the presupposition changes its bearer. In fact, in a sentence (b) *Mother is happy that even John passed the test* it is the presupposition of the Mother. (Perhaps, the speaker should agree with the Mother, otherwise some kind of quotation marks around *even* would have been inserted.) Thus, the presupposition IS transformed under the embedding; namely, the presupposing subject has changed.

In Karttunen 1974 it is said that verbs of saying and belief are plugs for presuppositions. But this is not enough. It is important for the sentence’s semantics that presuppositions of the speaker become propositional attitudes of the matrix subject in the context of the embedding propositional attitude predicate.

Example 3. Presupposition triggered by *also* is transferred, when the sentence is embedded, from the speaker to the subject of the matrix clause:

(c) *Zita tože umnaja* ‘Zita is also clever’;

(d) *Zita sčastliva, čto ona tože umnaja* ‘Zita is happy that she is also clever’.

Thus, a presupposition of a non-subordinate clause is, in the last analysis, a presupposition of the speaker. Only the speaker oriented definition of presupposition can account for the change of the presupposition’s subject in the context of propositional attitude verbs.

Cancellability of presuppositions

The notion of external negation should be mentioned (Kempson 1975 and many others), which makes no difference between presuppositions and assertions, assuming that all presuppositions are cancelable. For example, if it would have been possible to interpret *ne* in (17) as expressing external negation then (17) could have meant (17b) and won’t be excluded in context (17c):

(17) . Džon ne ogorčen, čto provalilšja na ékzamene ‘John doesn’t regret that he failed at the exam’;
   b. ‘Džon libo ne provalilšja, libo provalilšja i ne ogorčen’ ‘either John didn’t fail at the exam or he did but doesn’t regret it’;
   c. Džon ne ogorčen, čto provalilšja na ékzamene, – on jego sdal ‘John doesn’t regret that he failed at the exam – in fact, he passed it’.

Clearly, nobody uses negation like that. Presuppositions CAN be cancelled and arguments of factive verbs MAY acquire non-factive meanings, but only in very special contexts. For example, non-factive interpretation may become possible for verbs of inner state causation – as a result of specific assumptions arising in the context of discourse. Look at example (18).

(18) Ivan ne poradoval nas svoim vozvraščeniem ‘Ivan didn’t make us happy by his return’/by returning’.
Sentence (18) has an interpretation (i) corresponding to its lexico-syntactic structure; in other words, it allows an ordinary factual reading of its subordinate proposition ‘Ivan returned’. On the other hand, a non-factive reading (ii) may also become possible – due to the contextual assumption ‘for Ivan to return is to make us happy’. In the context of this assumption the only way for Ivan not to make us happy is not to return (i.e. not to commit the action of returning):

(i) ‘that Ivan returned didn’t make us happy’;
(ii) ‘Ivan didn’t return and, thus, didn’t make us happy’.

It is only in this context that the factive presupposition can be canceled – the presupposition that is triggered by lexical semantics and argument structure of the verb poradovat’ ‘make happy’.

The same phenomenon is demonstrated by examples (19) and (20):

(19) My ne oskorbim našego učitelja pokupnym podarkom ‘we won’t insult our teacher by a buyed present’; assumption: ‘to present a buyed present means to insult’
(20) Petja ne ogorčil mat’ ženit’boj ‘Pete didn’t distress his mother by marriage’; assumption: ‘to marry means to distress one’s mother’ (example from устой 1996).

Presuppositions and secondary predications

Now about projective meaning components others than presuppositions. It was noticed by several authors (Chierchia & McConnell-Ginet 1990; Beaver 1997; Potts 2005; Roberts 2006; Roberts, Simons, Beaver & Tonhauser 2009) that some constructions successfully pass the projection under negation test but are not comfortably categorized as presupposition-triggers: non-restrictive relative clauses (Bob, who was in Baku, missed our last seminar); appositives (John, as a conscientious colleague, came in time); parenthetical sentences and parenthetical adverbials (Luckily, John was at home). These syntactic constructions express what in Russian grammatical tradition is called SECONDARY PREDICATION. A secondary predication has a non-assertive status, but its falsity doesn’t make the utterance as a whole sound deviant or even queer. Secondary predications differ from asserted predications in that their falsity induces a dialogical reaction “Wait a minute!” (Potts 2008), instead of “You are wrong!”). But secondary predication is a purely syntactic phenomenon, and this is why secondary predications should rather be treated separately from both assertions and presuppositions, which are intensely connected with lexicon.

References

Зализняк Анна А., Левонтина И.Б. Отражение национального характера в лексике русского языка // Russian linguistics, 1996, v.XX.

http://lexicograph.ruslang.ru/03Members/Padu.htm.
дучева Е.В. Эффекты снятой утвердительности: глобальное отрицание русский язык в научном освещении, № 2(10), 2005, 17–42.


1 Introduction

The status of the prejacent of *only* is still a topic of linguistic debates. The reported experiments and observations are supposed to provide new data and evidence. Section 2 discusses existing theories of the meaning of *only*. Section 3 reports on the experiments on the semantics of *tylko*, which is assumed to be a Polish counterpart of English *only*. The experiments show clearly that the prejacent of *tylko* projects out of negation (section 3.1) and counterfactual *if*-clauses (section 3.2). However, *tylko* does not project so easily out of indicative *if*-clauses (section 3.3). In section 4, I discuss some additional tests which are designed to detect presupposition and I implement them to sentences with *tylko*. It occurs that the results of some of them in particular the *Hey, wait a minute*-test (section 4.1) and *Suspending the Prejacent* (section 4.2) suggest that the prejacent of *tylko* behaves in a similar way to assertion. Moreover, I show that the semantics of *only* differs from the semantics of *tylko*.

2 The meaning of *Only*

The meaning of a sentence with *only* consists of two meaning components: (1) the prejacent (the meaning of the sentence without an exclusive particle), and (2) the universal (the negative, exclusive meaning of the sentence with *only*). Let us consider the following example:

(1) Only James went to the Zoo.
   a. **Prejacent** → James went to the Zoo.
   b. **Universal** → Nobody else but James went to the Zoo.

In the case of sentence (1), the prejacent is the proposition that (1-a) *James went to the Zoo*, and the universal is the proposition that (1-b) *Nobody else but James went to the Zoo*. Although there are many theories regarding the relation between the sentence with *only* and its prejacent/universal, it is commonly assumed that the universal is entailed by the sentence in which it occurs. By contrast, the status of the meaning of the prejacent of *only* is debated. It is not clear if the prejacent is presupposed, entailed, implicated, or maybe something else.

Horn claims in an early paper (Horn 1969) that the prejacent is presupposed by the sentence in which it occurs, i.e., in the case of example (1), sentence (1) presupposes proposition (1-a). However, in subsequent work he turns into the existential presupposition theory of the prejacent (Horn 1996). According to this theory, sentence (1) does not presuppose (1-a), but the weaker proposition that *somebody came to the party*. McCawley (1981), and later van Rooij & Schulz (2005), argue that the prejacent is conversationally implicated by the sentence in which

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1 In the paper I use a term prejacent in a general sense, i.e., by prejacent I understand a proposition obtained after the deletion of the focus sensitive particle from a sentence.
it occurs. The disparate theory of the meaning of the prejacent was developed by Atlas (1993). He defends the position that both the prejacent and the universal are entailed, i.e., sentence (1) entails both (1-a) and (1-b). Ippolito (2006, 2008) does not agree with Atlas’ point of view. She claims that the relation between sentence (1) and (1-a) can be properly described using presuppositions. However, she argues that neither prejacent nor universal is presupposed, but rather the implication existential → prejacent, i.e., sentence (1) presupposes the complex proposition that If somebody went to the Zoo, then James went to the Zoo. Finally, Roberts (2006) shows the drawbacks of all of the above-mentioned theories, concluding that the prejacent of only can be described as a non-speaker-oriented implicature.

The semantic status of the prejacent of only is still the subject of scientific debate. In order to shed new light on the meaning of only, experiments on the semantics of Polish exclusive particle tylko were conducted.

3 Experiments

There is a wide range of exclusive particles in Polish, such as, for example, tylko, wyłącznie, jedynie. Tylko is the most typical and the one most frequently used of them. Moreover, it is assumed to have similar semantics to English only. For these reasons and because of the fact that it is impossible to consider the semantics of all the above-mentioned particles in the short paper, the text is delimited to the semantics of tylko.

A variety of different tests, such as the Hey, wait a minute!-test, so-called Horn’s Bet etc., were proposed in the literature2 to find out if a given constituent is presupposed by a sentence in which it occurs. However, to establish the primary facts about the projective properties of a Polish exclusive particle tylko a part of the family of sentences3 tests were used, i.e., (1) visibility to negation, and (2) projection out of if-clauses. Although they have some drawbacks, they are still the most popular and reliable tests for detecting presuppositions. The design of both experiments comes from the Questionnaire on Focus Semantics (Renans et al. 2011) which was created as a tool for a linguistic fieldwork on different aspects of focus semantics in the cross-linguistic perspective.

The fieldwork on Polish language was conducted in January 2011. Thirty-three first-year-students of psychology and Serbo-Croatian philology (10 men and 23 women, average age: 20.55 years, all Polish native speakers) took part in the reported experiment. The experiment consisted of two subparts: (1) visibility to negation, and (2) projection out of counterfactual if-clauses, which were used as fillers for each other. The part testing for visibility to negation comprised nine items per condition (eighteen tasks in total), and the test for projection out of counterfactual if-clauses comprised six items per condition (twelve tasks in total). This means that each participant was asked to carry out thirty tasks together. Both subparts of the experiment were balanced, i.e., each participant saw the same amount of conditions and no participant saw the same item twice. Moreover, all the sentences including tylko (in both experiments) were

2A range of tests for a projective meaning are discussed by Beaver, Roberts, Simons, and Tonhauser (Beaver et al. 2010).
3The family of sentences test consists of four subtests: (1) embed under negation, (2) embed under interrogation, (3) embed under a modal, and (4) embed in the antecedent of a conditional.
of the form \[tylko\ \text{SUBJ}VP\] and the following analysis are restricted to such sentences.

### 3.1 Visibility to Negation

Since an assertion is visible to negation, while a presupposition is not, the \textit{Visibility to Negation} test allows one to be distinguished from the other. The test consists of six short stories along with two questions about each of them. Question (a) is about the prejacent and question (b) is about the universal. The informants’ task was to answer the given questions, e.g.:

(2) Marysia, Paweł i Ania poszli na imprezę. \textit{To nieprawda, że tylko Marysia piła alkohol na imprezie.}

Marysia, Paweł and Ania went to party. \textit{It is not the case that only Mary drank alcohol at the party.}

a. Czy Marysia piła alkohol na imprezie?
   part. Marysia drank alcohol at party
   ‘Did Mary drink alcohol at the party?’
   ● Yes
   ● No
   ● It is not known.

b. Czy ktoś inny niż Marysia pił alkohol na imprezie?
   part. anybody other than Marysia drank alcohol at party
   ‘Did anybody other than Mary drink alcohol at the party?’
   ● Yes
   ● No
   ● It is not known.

Choosing answer ‘no’ to question (a) means that the prejacent is visible to negation, and is therefore asserted, whereas choosing answer ‘yes’ to question (b) means that the universal is visible to negation, and is hence asserted. By contrast, choosing answer ‘yes’ to question (a) and ‘no’ to question (b) suggest that the prejacent/universal is invisible to negation, and is therefore presupposed.

The results of the experiment are presented in table 1. They show clearly that the prejacent of \textit{tylko} is visible to negation and that the universal of \textit{tylko} is not. On the basis of these results a preliminary hypothesis can be formulated: the prejacent of \textit{tylko} is presupposed, and the universal of \textit{tylko} is asserted.

### 3.2 Projection out of counterfactual \textit{if}-clauses

The experimental set-up of the second sub-experiment was identical to the first one except for the fact that this time \textit{tylko} was embedded in the antecedent of the counterfactual \textit{if}-clause. The exemplary task is given below:
<table>
<thead>
<tr>
<th>answer</th>
<th>prejacent (cond. a)</th>
<th>universal (cond. b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>231 (77.8%)</td>
<td>243 (82%)</td>
</tr>
<tr>
<td>no</td>
<td>11 (3.7%)</td>
<td>5 (2%)</td>
</tr>
<tr>
<td>I do not know</td>
<td>53 (17.8%)</td>
<td>46 (15%)</td>
</tr>
<tr>
<td>Lack of answer</td>
<td>2 (0.7%)</td>
<td>3 (1%)</td>
</tr>
</tbody>
</table>

Table 1: Visibility to Negation

<table>
<thead>
<tr>
<th>answer</th>
<th>prejacent (cond. a)</th>
<th>universal (cond. b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>88 (44%)</td>
<td>130 (66%)</td>
</tr>
<tr>
<td>no</td>
<td>13 (7%)</td>
<td>3 (1%)</td>
</tr>
<tr>
<td>I do not know</td>
<td>95 (48%)</td>
<td>63 (32%)</td>
</tr>
<tr>
<td>Lack of answer</td>
<td>2 (1%)</td>
<td>2 (1%)</td>
</tr>
</tbody>
</table>

Table 2: Projection out of counterfactual if-clause

A. Czy Marek jadł lody?
   part. Marek ate ice-cream?
   ‘Did Marek eat ice-cream?’
   1. Yes
   2. No
   3. It is not known.

B. Czy ktoś inny niż Marek jadł lody?
   part. anybody other than Marek ate ice-cream?
   ‘Did anybody other than Marek eat ice-cream?’
   1. Yes
   2. No
   3. It is not known.

Assuming that presupposition projects out of the if-clause, while assertion does not (Karttunen and Peters 1979), the experiment allows us to distinguish the two meaning components. If the participant answers ‘yes’ to (a) question, it means that the prejacent is presupposed. If the participant answers ‘no’ to (b) question, it means that the universal is presupposed. The results of the experiment are shown in table 2.
The results of the reported experiment suggest that the prejacent of *tylko* projects out of the counterfactual *if*-clauses, while the universal does not. Moreover, they converge with the results from the *Visibility to Negation*-test. Seemingly the results are straightforward and they seem to confirm the presuppositional account of the meaning of the prejacent (Horn 1969). However, it is important to note that only counterfactual *if*-clauses were used in the experiment and it is not said that the prejacent of *tylko* behaves uniformly when it is embedded in the other kinds of *if*-clauses. This, and the fact that not everything that projects must necessarily be a presupposition (Beaver et al. 2009, 2010), (Roberts et al. 2009) makes the analysis more obscure and complicated.

### 3.3 Projection out of indicative *if*-clauses

It is important to check, whether the prejacent of *tylko* projects indeed so easily from different kinds of *if*-clauses. To verify this, another experiment was conducted – (3) projection out of indicative *if*-clauses. The design of the experiment was the same as for the projection out of counterfactual *if*-clauses. Moreover, the same lexical items were used in both experiments. The only thing that was changed in experiment (3) in comparison with experiment (2) was the type of the conditional (but in both experiments they were past-oriented.) An exemplary task from experiment (3) is presented below:


‘Joanna and Piotr organized a birthday party for their mother. *If only* Marek ate the ice-cream, they had a lot of extra dessert.’

a. Czy Marek jadł lody?
   part. Marek ate ice-cream?
   ‘Did Marek eat ice-cream?’
   1. Yes
   2. No
   3. It is not known.

b. Czy ktoś inny niż Marek jadł lody?
   part. anybody other than Marek ate ice-cream?
   ‘Did anybody other than Marek eat ice-cream?’
   1. Yes
   2. No
   3. It is not known.

Eleven students of hungarian philology, psychology, environmental engineering, and biotechnology took part in the experiment (six women, five men, average age: 21.65, all the participants were Polish native-speakers.) The experiment consisted of six items per condition (twelve tasks
We can see that it is much more difficult for the participants to ascribe a truth value both to the prejacent and to the universal when they are embedded in the indicative if-clause than when they are embedded in the counterfactual if-clause (there were 48% of ‘I do not know’ answers to the questions about the prejacent, and only 32% of ‘I do not know’ answers to the questions about the universal in the case of the counterfactual if-clauses, and 70% and 88% of the answers respectively in the case of the indicative if-clauses.) Taking into consideration that only 30% of the result points suggest that the prejacent projects out of the indicative if-clauses and as much as 70% result points suggest that the informants could not tell whether the prejacent projects or not (in the case of the counterfactual if-clauses a proportion of the ‘yes’ answer to ‘I do not know’ answer to the question about the prejacent was 44% to 48%) we cannot conclude that the prejacent is really presupposed and, what is more, we cannot even claim that the prejacent projects out of indicative if-clauses. Notice, however, that the contrast between the prejacent and the universal behavior is preserved (30% of the result points in the case of the prejacent and 1% of the result points in the case of the universal suggest that the given meaning component projects.)

3.4 Discussion

The converging results from the first two experiments suggest that the prejacent is presupposed by the sentence in which it occurs confirming Horn’s (1969) early analysis of the meaning of only. However, we can also observe that the prejacent of tylko does not project so easily from all kinds of if-clauses in particular indicative ones. The ambiguous behavior of the prejacent and the universal of tylko is caused (1) by the different semantics of counterfactual and indicative if-clauses, and/or (2) by the semantics of sentences with tylko.

At first sight, the first explanation seems to be more plausible. Counterfactual if-clauses suggest that the situation presented in the sentence does not hold in the actual world. Note that in the test an informant is asked to assign a truth-value to the antecedent of the counterfactual if-clause relativized to the actual world. For these reasons the listener with a relatively high certainty can judge whether the antecedent of this kind of if-clause is true in the actual world or not. On the other hand, when the indicative conditional is used it is not known if the situation described in the sentence took place or not — a listener has just no clue. That is why in such a case it is problematic to assign a truth-value to the both meaning components of the sentence with tylko (experiment (3)). It seems that the semantics of if-clauses can explain different behavior of universal in experiment (2) and (3). In the case of the prejacent of tylko the solution is not so straightforward. Note that if the different projective behavior of tylko is regulated by the
semantics of the given if-clause, we should obtain a similar results to those from experiments (2) and (3) when embedding the presuppositional meaning components of other focus sensitive particles in the both kinds of if-clauses. But this is not the case. Instead, it occurs that the presuppositional additive meaning component of the sentences with *too* and *even* projects when they are embedded in the counterfactual and indicative if-clauses alike. On the other hand, their prejackets (traditionally assumed to be the asserted part of the meaning of the sentences with *too* and *even*) do not project from either type of if-clauses. Let us look at the following examples and the answers to them (the answers are in accordance with the intuitions of the Polish native speaker informants):

(5) Counterfactual if-clause

a. Joanna i Piotr organizowali przyjęcie urodzinowe dla swojej mamy. *Gdyby* także/nawet Marek jadł lody, to nie mieliby dodatkowych porcji *also/even* Marek ate *ice-cream*, then neg. had *extra* portions deseru.

‘Joanna and Piotr organized a birthday party for their mother. *If also/even Marek had eaten the ice-cream*, they would have had a lot of extra dessert.’

(i) Czy Marek jadł lody?
    part. Marek ate *ice-cream*?
    Did Marek eat ice-cream?
    ● No

(ii) Czy ktoś inny niż Marek jadł lody?
    part. anybody other than Marek ate *ice-cream*?
    Did anybody other than Marek eat ice-cream?
    ● Yes

(6) Indicative if-clause

a. Joanna i Piotr organizowali przyjęcie urodzinowe dla swojej mamy. *Jeśli* także/nawet Marek jadł lody, to nie mieli dodatkowych porcji *also/even* Marek ate *ice-cream*, then neg. had *extra* portions deseru.

\[\text{The meaning of sentences with *too* consists of two meaning components. E.g., in the case of sentence } \text{Anne bought [a car]}_{F} \text{ too the two meaning components are as follows: (1) Anne bought a car (prejacent, asserted part of the meaning), and (2) that there is a salient instance of such a thing that Mary bought it and it is not a car } \approx \text{ Anne bought something else than a car (presupposed, additive part of the meaning of the sentence with *too*). In the case of the sentences with *even* three meaning components can be distinguished, e.g., in the case of a sentence } \text{Anne even bought [a car]}_{F} \text{ there are: (1) Anne bought a car (prejacent, asserted part of the meaning), (2) Anne bought something else beside a car (presupposed, additive part of the meaning), and (3) a proposition that a car was the least likely thing to be bought by Anne (presupposed (?)}, \text{ implicated (?) part of the meaning) (König 1991), (Karttunen and Peters 1979). Notice that since both *too* and *even* are the additive particles the same propositions are asserted, and the same propositions are presupposed by the sentences containing one of them (for the purpose of this paper, it is enough to consider two meaning components of *even*, i.e., asserted (prejacent), and additive).} \]
Joanna and Piotr organized a birthday party for their mother. If also/even Marek ate the ice-cream, they had a lot of extra dessert.

(i) Czy Marek jadł lody?
part. Marek ate ice-cream?
Did Marek eat ice-cream?
• It is not known.

(ii) Czy ktoś inny niż Marek jadł lody?
part. anybody other than Marek ate ice-cream?
Did anybody other than Marek eat ice-cream?
• Yes

As we can see, the presupposed (additive) parts of the meaning of the sentences with also and even project out of the if-clauses irrespective of which if-clause was used. It suggests that it is not the semantics of the if-clause but rather the semantics of tylko is the reason for the different projective effects when embedding it in the counterfactual and indicative if-clauses.

Moreover, the conclusion that the prejacent of tylko is presupposed is also questioned by the recent research of Beaver, Roberts, Simons, and Tonhauser (Beaver et al. 2009, 2010), (Roberts et al. 2009). They claim that not everything that projects is presupposed. It would thus seem that the reported experiments check for the projective meaning of tylko rather than for its presuppositional status. To establish whether the prejacent of tylko is presupposed or not other tests should be used. Let us see what results we obtain while conducting other common tests for detecting presuppositions.

4 Tylko and other Tests for Presuppositions

In many cases, tylko behaves like English only, e.g., it is visible to negation, it gives similar effects in the so-called Horn’s bet and in the occurrence after questions-test (Roberts 2006). At the same time, there are some tests in which we obtain different results for tylko and only.

4.1 Hey, wait a minute-test

_Hey, wait a minute-expressions are claimed to call into question the presuppositional content of the utterance but not the asserted one (Shannon 1976), (von Fintel 2004). Hence, it is used to detect presuppositional parts of the meaning. By applying the _Hey, wait a minute-test to English exclusive particles, we obtain the following results (examples are taken from Roberts (2006)):_

(7) Only Lucy came to the party.
   a. Hey, wait a minute — I had no idea Lucy came to the party! I didn’t even know she was in town!
   b. #Hey wait a minute — I had no idea that nobody else came!
In contrast, when the *Hey, wait a minute*-test is implemented to the Polish sentences with *tylko*, we obtain the following results:

(8) Tylko Natalia przyjechała wczoraj do Berlina.
    only Natalia came yesterday to Berlin
    a. Hey, wait a minute — I had no idea that Natalia came to Berlin!
    b. Hey, wait a minute — I had no idea that nobody else came!

In the case of Polish sentences, the informants accepted both sentences (8-a) and (8-b). It seems that both the prejacent and the universal of *tylko* can be called into question. Again, the differences in the behavior of the English and Polish exclusive particles can be either explained by the differences in the working of the test or by the differences in the semantics of *only* and *tylko*. Interestingly, in the case of the sentences with *too*, the informants judge the *Hey, wait a minute* expression as infelicitous in the case of the asserted meaning component (9-a), and felicitous in the case of the presupposed meaning component (9-b):

(9) Basia też przyjechała wczoraj do Berlina.
    Basia also came yesterday to Berlin.
    a. #Hey, wait a minute — I had no idea that Basia came to Berlin!
    b. Hey, wait a minute — I had no idea that somebody came to Berlin!

This means that for the additive particles, the *Hey, wait a minute*-test works in similar ways in English and Polish suggesting that it is the different status of the prejacent of *tylko*, not the design of the test, that is responsible for the differences observed between (7) and (8).

### 4.2 Suspending the Prejacent

It is claimed (Roberts 2006), (Beaver and Clark 2008), that in the case of the sentences with *only*, the truth of the prejacent but not the truth of the universal can be suspended. Consider an example from Roberts (2006):

(10) a. Only Lucy can pass the test, and it’s possible even she can’t.
    b. #Only Lucy can pass the test, [and/but] it’s possibile that someone else can.

We can see that the sentence with the suspended prejacent (10-a) is judged as felicitous whereas the sentence with the suspended universal is judged as infelicitous (10-b).

In contrast to the English results, Polish native speakers judged both sentences with the suspended prejacent (11-a) and with the suspended universal (11-b) as infelicitous, e.g.:

(11) a. #Tylko nasz nauczyciel może pomóc nam wyjść z tych kłopotów i
    Only our teacher can help us go out from these troubles and
    może nawet nie może tego zrobić.
    perhaps even he not can this make
    ‘Only our teacher can help us and perhaps even he can’t.’
    b. #Tylko nasz nauczyciel może pomóc nam wyjść z tych kłopotów, ale inni
    Only our teacher can help us go out from this troubles but other
nauczyciele też mogą to zrobić.
‘Only our teacher can help us and perhaps also another teacher can.’

Summing up, Polish exclusive particle tylko shows a different behavior to English only in the case of both tests (Hey, wait a minute-test and Suspending the Prejacent) discussed in this section. Interestingly, the differences seem to be caused not by the drawbacks of the test, but rather by differences in the semantics of tylko.

5 Conclusions

Summing up, the experiments reported in the paper have shown that:

- the prejacent of tylko projects out of the negation and counterfactual if-clauses
- there are differences in the projective behavior of the prejacent and the universal of tylko when it is embedded in the counterfactual and indicative if-clauses
- it is claimed that the prejacent and the presupposed meaning component of other focus sensitive particles (too, even) show an identical projective behavior when they are embedded in the counterfactual and indicative if-clauses
- the Hey, wait a minute-test gives different results for the prejacent of only and the prejacent of tylko
- the prejacent of only can be suspended whereas the prejacent of tylko cannot.

What can we learn from these observations? First of all, we can draw some methodological conclusions. While looking for potential presuppositional meanings of a given constituent (especially in underresearched languages) the fieldworker should take care which conditional is used in the experiment. In the case of the Polish language, it seems that the indicative if-clauses are better for experiments which are designed to find out a potential presuppositional meaning component of a given clause. The counterfactual ones seem to be a bit too tolerant (if we take an assumption that the additive part of the meaning of too is the prototypical presupposition). By contrast, it seems that the counterfactual if-clauses are better for the experiments which look for a projective meaning of a given clause. For fieldwork on understudied languages, a good suggestion would be to look for a projective behavior of the given constituent while embedding in the different kinds of if-clauses.

Second, it has emerged that the projective meaning of tylko differs from the projective meaning of other focus sensitive particles, such as też (too), and nawet (even). Assuming, as we did above, that the additive part of the meaning of the sentence with też is presupposed, we can see that the prejacent of only does not show such a strong presuppositional behavior as the latter.

What is more, the behavior of the prejacent of tylko differs from the behavior of the prejacent of only. The results of the Hey, wait a minute-test, and Suspending the Prejacent show
that the prejacent of *tylko* has more characteristics of an assertion than the prejacent of *only* (in both tests the prejacent of *tylko* actually behaves like an assertion) possibly providing support for entailment analysis of the prejacent in Atlas (1993).

Moreover, notice that the prejacents of many focus sensitive expressions, such as *even, too, always* are asserted. It seems that all the difficulties in the analysis of the prejacent and the universal of *only* and *tylko* are ultimately caused by the reversed status of the propositions expressed by both meaning components. The semantics of *tylko* suggests that the status of the prejacents of the above-mentioned focus sensitive expressions are more similar than the semantics of *only* seems to suggest.

**References**


Projective signals of weak necessity modals
Aynat Rubinstein
University of Massachusetts Amherst

This paper investigates the hypothesis that the semantics of weak necessity modals like should/ought to includes a conventional signal requiring departure from common ground assumptions in the evaluation of the modal claim. I investigate the properties of this signal, suggesting that it is a type of meaning that is projective, not at-issue, antibackgrounding in a sense, and grammatically determined. Thus, it is most similar to a type of presupposition that is nonetheless not intuitively pre-supposed. Comparing the proposed weakness signal to an evidential signal with similar projective properties that has been argued to accompany epistemic modals, I speculate that the two signals have independent sources.

1 Weak necessity as departure from Common Ground assumptions

Necessity modals show sensitivity to joint assumptions in the discourse in previously unnoticed ways. Consider the goal-oriented claims in (1). Suppose there are two routes to your destination, but you have a preference that favors one over the other. You mention you’d like to avoid big cities, and this leaves just one option. Interestingly, communicating that this one route is indeed necessary depends on how exactly you express your preference. Ought to is felicitous in case the goal of avoiding big cities is not yet established in the discourse (1a). The minute it is made clear that this more detailed goal is the one under discussion, as in (1b), have to becomes appropriate and ought to no longer is.

(1) a. You: Avoiding big cities would be nice.
   Me: OK then, you ought to (‘have to) take Route 1.

b. You: No big cities please!
   Me: OK then, you have to (‘ought to) take Route 1.

In both cases, the sub-goal of avoiding big cities is expressed. The puzzling fact is that this sub-goal seems to have a different effect on what count as live possibilities in the two examples. In (1b), the sub-goal might be characterized as “strong”. It causes all possibilities in which you pass through big cities to be ignored, so a have to claim truthfully characterizes the remaining possibilities. In (1a), the possibilities in which you drive through big cities somehow remain live options, despite the preference that was expressed. We know this because a strong necessity claim with have to is false in (1a). Ought to can nevertheless use the sub-goal to zoom in on just those possibilities in which big cities are avoided.

Ought to allows speakers to bring in assumptions that are not already ‘on the table’ into their modal reasoning. In (1), the additional assumption is that big cities will be avoided. It enters the set of propositions that describes contextually determined priorities or preferences, i.e., the ordering source in standard terminology (Kratzer, 1981, 1991).

This is not the only kind of discourse dynamic that weak necessity modals take part in, however. The sentence in (2) is a case in point. Suppose I know that you are hoping we will find a ride to the concert, and there are still a few people with cars that you haven’t asked. I personally am making the assumption that we won’t find a ride, in which case it is necessary for us to leave now and catch a bus. I can express this goal-oriented claim with should, but not with have to.
(2) To arrive at the concert on time without rushing or spending too much money, we should (\(\overset{\circ}{\text{have to}}\)) leave now.

_Should_ makes a different contribution than _have to_ here, even though the relevant preferences are highly articulated, not supplemented by additional considerations, and made explicit. The weak necessity modal is recruited to communicate that possibilities that are still live options in the common ground (namely, us getting a ride to the concert) are being ignored for the purpose of the necessity claim. The picture that emerges about the semantics of weak necessity modals is shown in Figure 1.

![Figure 1](image_url)

Figure 1: A weak necessity modal picks out a subset of the worlds that are accessible based on common ground assumptions, without changing common ground assumptions.

Despite its weakness, _ought_ is an ordinary necessity modal. For a statement _ought to q_ to be true, it has to be the case that all the worlds that end up in the modal’s domain of quantification are _q_-worlds (von Fintel and Iatridou, 2008, 119). I follow these authors in pursuing a domain restriction approach to the weakness of _ought to_, but propose the following two innovations:

i. Domain restriction results from adding premises to one of two contextually provided parameters: the modal base or the ordering source.

ii. Premises thus added do not influence the public conversational record (or common ground).

The analysis I will pursue endows weak necessity modals with an ordinary universal quantification semantics which is supplemented by a requirement, as in (3), that the necessity claim rests on assumptions that fall outside the discourse common ground. This preliminary statement of the requirement, or signal, assumes a premise set treatment of modal parameters. It allows both modal parameters to be responsible for the modal’s restricted domain ((i) above).

(3) **The conventional Signal of Weak necessity modals (Preliminary):**

The value of a parameter the modal relies on (modal base _\(f^+(w)\)_ or ordering source _\(g^+(w)\)_ is a superset of the conversationally agreed upon value of that parameter.

Let’s assume, following Stalnaker (1974, 1978), that discourse participants keep track of a repository of shared assumptions in a conversation. The set of shared assumptions is the _common ground_. It is a set of propositions (where propositions are modeled as sets of possible worlds). The intersection of these propositions is the _context set_. As new propositions are asserted and endorsed by the conversation participants, the mutually assumed information potentially grows, and the context set shrinks.
When we refer to “the conversationally agreed upon” values of modal parameters, we refer to a subset of propositions in the common ground—a component of the conversational score in Lewis’s (1979) terms—that the discourse participants take to be relevant for modal reasoning at that point in the conversation. By assumption, strong (necessity) modals default to the value of \( f \) and \( g \) in the conversational record in the absence of overt in view of... phrases (ibid. p. 354). I will use the subscripted \( f_{cg}(w) \) and \( g_{cg}(w) \) to refer to these parameters.

Stating the requirement in (3) quasi-dynamically, we may say that ought to signals a non-trivial monotonic update of a contextually determined modal parameter. Non-triviality simply means that \( f^+(w) \) and \( g^+(w) \) provide the modal with a smaller domain of quantification than what \( f_{cg}(w) \) and \( g_{cg}(w) \) determine.

Before we move on to study the status of this signal and its projective properties (section 2), we must draw out additional aspects of the semantics of weak necessity. In particular, we need to understand (ii) above: what does it mean that the update triggered by ought to seems not to affect the conversational record?

A weak necessity claim that draws attention to a subset of the jointly assumed accessible worlds cannot be followed by a strong necessity claim that would be true in that subset of worlds (4). This is the first piece of evidence that the update triggered by ought to does not affect the values of \( f_{cg}(w) \) and \( g_{cg}(w) \).

(4)  A: Route 1 and Route 2 are both excellent ways to reach his destination.
      B: He ought to take Route 2 through town B, because it’s prettier.
      A: So, he has to take Route 2.

Sequences of conflicting weak necessity claims, like (5), also show that ought claims do not affect changes on the contextual parameters \( f_{cg}(w) \) and \( g_{cg}(w) \). Each ought claim highlights a different subset of the same baseline, which is the set of jointly assumed accessible worlds. At the end of such exchanges, the shared assumptions in the discourse are just as they were in the beginning: the person’s goal is to reach his destination, and there are many ways to get there. If each ought claim had triggered an update of common ground modal parameters, how would it be possible for the record to “snap back” precisely to the particular values these parameters had at the outset?

(5)  A: There are \( k \) ways to get to his destination. Which should he take?
      B: He ought to take Route 1 through town A because it’s faster.
      C: No, he ought to take Route 2 through town B because ...
      ...
      L: No, he ought to take Route \( k \) through town K because ...

With these arguments against a sequential dynamic update analysis of \( f_{cg}(w) \) and \( g_{cg}(w) \), I propose (6) as the denotation of weak necessity modals.

(6)  a. The conventional Signal of Weak necessity modals (SigW):
     The modal base \( f^+(w) \) or ordering source \( g^+(w) \) are monotonic updates of the common ground modal parameters \( f_{cg}(w) \), \( g_{cg}(w) \).
     b. \( \lvert\lvert \text{ought to} \rvert\rvert (f^+(g^+)(q))(w) = \forall w' \in \text{Acc}_{f^+(w),g^+(w)}(q(w')) \), where for any modal base \( f \), ordering source \( g \), and world \( w \), \( \text{Acc}_{f(w),g(w)} \) are the worlds in \( \bigcap f(w) \) most highly ranked by \( g(w) \).
According to this analysis, weak necessity modals have an ordinary Kratzerian semantics of necessity which is supplemented by a requirement that the necessity relies on assumptions outside the discourse common ground. The modal base or ordering source conjured by a speaker using *ought to* are required to be supersets of the jointly assumed modal base or ordering source. The result is a smaller domain of quantification for the universal quantifier in (6b) and thus a weaker modal claim (weaker than a strong necessity claim, which is based on common ground values of the modal parameters).

2 The status of the proposed meaning component

This section investigates the status of the meaning component in (6a), which has been stated as a type of presupposition or discourse-related definedness condition. In what follows, I will use the neutral term SigW (‘the conventional Signal of Weak necessity modals’) to refer to this signal. We will see that SigW shows projective behavior, is not at-issue, is antibackgrounding in a sense to be defined, and is grammatically determined. Thus, it is most similar to a type of presupposition that is nonetheless not pre-supposed or backgrounded in an intuitive sense.

2.1 General properties of SigW

SigW is not at-issue content. It is not part of the “main point” of a weak necessity claim. As such, its contribution cannot be directly denied by *No!* or *That’s not true*, but only rejected indirectly, as in (7b) (Beaver et al., 2009). The context for (7) and following dialogs is a costume-making workshop. The goal of the workshop is to make beautiful costumes while spending as little money as possible. (7a) shows a failed attempt to deny SigW directly by reminding the speaker that the goal that necessitates the prejacent (the proposition embedded under the modal) is in fact jointly assumed in the conversation. In order to deny SigW on these grounds, an indirect rejection mechanism such as *Whaddaya mean?* must be used.

(7) A: We ought to use materials we already have at home.
   a. B: That’s not true (/No!). *Zero-spending is our stated goal.*
   b. B’: Whaddaya mean *ought to?* Zero-spending is our stated goal; we have to use materials we already have at home!

Direct denial targets the quantificational statement that the modal contributes. In (8), for example, an overt rationale clause fixes the modality as goal-oriented (we will follow Kratzer 1981 for the purpose of the discussion and assume that the modal base is circumstantial and the ordering source is teleological in goal-oriented modal claims). *That’s not true* challenges the claim that all the most relevant circumstantially accessible worlds in which the stated goal is achieved are ones in which the embedded proposition is true.

(8) A: In order to spend little money creating our beautiful costumes, we ought to use materials we already have at home.
   B: That’s not true (/No!). We ought to (/can also) open a second-hand costume exchange shop.

This is similar to the type of disagreement that Lewis (1979) has argued arises quite generally in conversation as interlocutors keep score of how modals are interpreted. His example features disagreement following a strong necessity claim.
“Suppose I am talking with some elected official about the ways he might deal with an embarrassment. So far, we have been ignoring those possibilities that would be political suicide for him. He says: ‘You see, I must either destroy the evidence or else claim that I did it to stop Communism. What else can I do?’ I rudely reply: ‘There is one other possibility – you can put the public interest first for once!’”

(Lewis, 1979, 354)

Lewis goes on to say that once additional possibilities are taken into consideration, they cannot be ignored. In his terms, the boundary between relevant and ignored possibilities “once shifted outward, stays shifted” (p. 355). Moreover, he notes an asymmetry in the direction in which the boundary tends to shift (ibid.):

“We get the impression that the sceptic, or the rude critic of the elected official, has the last word. Again this is because the rule of accommodation is not fully reversible. For some reason, I know not what, the boundary readily shifts outward if what is said requires it, but does not so readily shift inward if what is said requires that.”

An interesting property of weak necessity modals according to the proposal in (6) is that they offer a means of shifting the boundary in the “wrong” direction, by focusing on a subset of the possibilities that interlocutors are jointly entertaining at particular points in a conversation. However, the shifts they induce go unrecorded, as argued above in connection with examples (4) and (5). They are based on extra assumptions that an agent entertains privately, and thus do not influence the public conversational score.

Unlike a conversational implicature, SigW is not cancelable. As (9a) shows, a speaker who utters ought to q cannot cancel the implication that they have gone beyond common ground assumptions in their reasoning. There is an air of contradiction if the speaker subsequently tries to give their conclusion the status of a mutually agreed upon conclusion. If ought to is replaced by have to, this air of contradiction disappears (9b), suggesting that the source for the infelicity is a conventional part of the meaning of ought to.

(9)  a. We ought to open a second-hand exchange shop; #actually, I believe this is our conclusion as a group.
    b. We have to open a second-hand exchange shop; actually, I believe this is our conclusion as a group.

Here we can draw a parallel between the “common ground novelty” signal of modals like ought to and should and the signal, contributed by evidential markers in many languages, specifying the source of information a speaker is basing their claim on. Non-cancelability of evidential contributions is exemplified below with the Bulgarian ‘Perfect of Evidentiality’ (Izvorski, 1997) and the St’át’imcets reportative evidential (Matthewson et al., 2007).¹

¹See also Faller (2002) on evidentials in Cuzco Quechua and Murray (2010) on evidentials in Cheyenne (especially §3.3, where the challengeability properties of different kinds of evidentials crosslinguistically – illocutionary and epistemic – are compared).
Izvorski (1997) and Matthewson et al. (2007), among others, treat evidential contributions as presuppositions. Importantly, this conclusion does not extend to SigW. Despite similarities between evidential signals and SigW, I will use the *Hey, wait a minute!* test for presuppositions to argue that SigW is not actually presupposed content.

von Fintel (2004) (and earlier Shanon 1976) proposed that presuppositions can be detected using a test superficially similar to the indirect denial test in (7b). In its full form, however, this test includes not just an interjection that stalls the conversation (that is, *Hey, wait a minute!*), but also a followup – *I had no idea that X* – with which the hearer “legitimately complains” that the presupposed content X had not been established in the conversation prior to the speaker’s utterance (von Fintel, 2004, 317). This followup is infelicitous following a weak necessity claim (where SigW is substituted for X in *I had no idea that X*).

I take the dialog in (11) as evidence that SigW is not presupposed or backgrounded information, at least in the intuitive sense of these terms. In fact, SigW has a special kind of antibackgrounding effect. The addressee is not offered any concrete new information about the speaker’s grounds for making the weak necessity claim, but the modal nonetheless signals that such information is the basis for the speaker’s reasoning. It is a natural discourse move for an addressee (B in (12)) to follow up the speaker’s necessity claim of *ought to q* with a request for information about the additional assumptions that led the speaker to conclude that *q* is a necessity (albeit a “weak” one). It is then natural for the speaker (A) to make these assumptions public.

(11) A: We ought to use materials we already have at home.
    B: *Hey, wait a minute!* I had no idea that you were making additional assumptions. (/I had no idea idea you were taking into account additional preferences.)

    I take the dialog in (11) as evidence that SigW is not presupposed or backgrounded information, at least in the intuitive sense of these terms. In fact, SigW has a special kind of antibackgrounding effect. The addressee is not offered any concrete new information about the speaker’s grounds for making the weak necessity claim, but the modal nonetheless signals that such information is the basis for the speaker’s reasoning. It is a natural discourse move for an addressee (B in (12)) to follow up the speaker’s necessity claim of *ought to q* with a request for information about the additional assumptions that led the speaker to conclude that *q* is a necessity (albeit a “weak” one). It is then natural for the speaker (A) to make these assumptions public.

(12) A: We ought to use materials we already have at home.
    B: Why do you think that’s necessary? We can also open a second-hand costume exchange shop.
    A: I’m assuming that’s not an option.

    For completeness, note that a statement of *ought to q* does give rise to at least one kind of cancelable implication: the scalar implicature that *have to q* is false (Horn, 1972). The sentence in (13) is a case in which an *ought* claim can be strengthened to a *have to claim* without a sense of denial.

(13) You ought to wash your hands – in fact, you have to.
    (von Fintel and Iatridou, 2008, 117(5))

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146

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2See Potts (2008), footnote 1, for lists of authors who have used the two different “versions” of the test.
2.2 Projective properties of SigW

SigW, the implication that the speaker is entertaining assumptions that are not in the common ground, is an implication of sentences with *ought to* and *should* that survives the entailment-canceling effects of questions and negation. SigW is also understood as a speaker commitment when a simple sentence containing a weak necessity modal is embedded in the scope of displacement operators, although in these cases the operator itself (an *if*-clause or a possibility modal) could be responsible for the implication. This meaning component of weak necessity modals can thus be characterized as a *projective meaning*.³

(14) An implication *projects* if and only if it survives as an utterance implication when the expression that triggers the implication occurs under the syntactic scope of an entailment-canceling operator.

(15) **Train tickets.** I’m buying train tickets for my friend. The ticket booth worker says that both the A-train and the B-train fit the departure time and price range I have specified. I realize my friend didn’t say anything about when she needs to arrive at her destination.

   Me: (What about travel duration?) Should she take the A-Train?

   When I ask the ticket booth worker if my friend should take the A-Train, I am asking about considerations other than the ones which have been established in our conversation (departure time and price). My addressee can then respond by trying to draw these extra assumptions out, as in (16).

   (16) Me: (What about travel duration?) Should she take the A-Train?

       Ticket booth worker: Yes, if she wants the faster option.

   Note that substituting a strong necessity modal instead of *should* in these examples results in an infelicitous discourse. It would be awkward to ask the ticket booth worker *Does she have to take the A-Train?*, when all we’ve talked about are departure times and prices. Similarly, the *have to* variant of the question in (17) would produce an awkward moment at a restaurant. The *should* variant simply invites the waiter to inquire about their patron’s private preferences.

   (17) To the waiter: What should I (*I* do I have to) get today?

       Waiter: It depends . . . ! If you don’t have much time, go with the fish; if you are adventurous, try the chef’s special.

   SigW also seems to project when *ought to q* occurs in the antecedent of a conditional, as in (18). In this conversation, the speaker is committed to having taken into account the possibility that the traveling customer has a preference for arriving quickly at her destination – something that is not in the common ground.

³See Karttunen (1974), Chierchia and McConnell-Ginet (1990), Beaver (2001), and Beaver et al. (2009) for an overview of the “family of sentences” tests.
(18) Ticket booth worker: Here are some other things to think about. The A-train is faster, but it doesn’t have any room for suitcases.
If (in light of her schedule) she ought to take the faster train, she’ll have to travel light.

Whether or not this is evidence for projection of SigW is not clear, however. The inference about the speaker’s grounds for making the modal claim could just as well be blamed on the semantics of the if-clause, which itself manipulates modal contextual parameters (in particular, the modal base of a modal in its scope; Kratzer 1981). The fact that have to can replace ought to in this example without resulting in infelicity also suggests that the conditional is responsible for the “projection” of the inference.

The final entailment-canceling operator I consider is negation. Testing projection of SigW under negation is complicated because weak necessity modals in English tend to outscope sentential negation (Cormack and Smith 2002, a.o.). Recent research on the polarity sensitivity of these modals nevertheless suggests some ways of forcing them into the crucial configuration for testing projection, under negation.

Iatridou and Zeijlstra (2009) and Homer (to appear) have argued that some English necessity modals (including should, ought to, and must) are Positive Polarity Items (PPIs).4 Accordingly, they claim, such modals must move out of the scope of negation (i.e., out of their assumed base position inside VP), unless shielded from negation by certain intervening quantifiers or rescued from negation by another downward entailing operator (Szabó 2004, Chierchia 2004, Homer 2010). In (19), the universal quantifier everyone is said to shield the modal, allowing it to be interpreted within the scope of negation despite its PPI-hood. The relevant interpretation of this sentence can be paraphrased as ‘It is not the case that everyone has to jog’. The sentence also has a salient so-called ‘neg-raising’ paraphrase: ‘There is some x such that it is required that x doesn’t jog’.

(19) Not everyone should jog.
    ‘Not everyone is required to jog.’
    (Homer, to appear, ex. (62c))

It should be noted that speakers find it difficult to shake off the ‘neg-raising’ interpretation of sentences like this, so it is not clear that the noted interpretation of (19) is actually available. There is another way to satisfy the polarity sensitivity of the modal, however, in which the intended interpretation is easier to perceive. It involves placing the modal under periphrastic negation, as in (20a) (see related discussion of superordinate negation in Homer 2010). Such sentences can be used to test the projection properties of SigW from under negation.

(20) a. It is not the case that John should jog. (can mean ‘there is no obligation to jog’, not > should)
    b. John shouldn’t jog. (should > not, not not > should)

Suppose we are a team of 3 people that signed up for a special kind of team race. The rules are that the first leg must be a run, but the other two legs are “free style”: the last two team members are free to choose between running and walking. Suppose our group’s goal is to set a new team record, and consider the following modal claims in this context.5

4Their claims are focused on deontic (or more generally, non-epistemic) interpretations of these modals, to avoid complications due to the Epistemic Containment Principle (von Fintel and Iatridou, 2003).
5Note that there is no team member that has to walk (i.e. not-run) in order to set a new record, so the ‘neg-raising’ interpretation of a sentence like (19) is false in this scenario.
(21) Team leader: It is possible to break the record without all of us running, but the margin would be smaller. To be confident we’ll break our record, everyone should run.

The team leader describes a space of circumstantially accessible goal-worlds containing some worlds in which (a record is set and) all team members run, and other worlds in which (a record is set but) not all team members run. In his should claim, he zooms in on the first subset of worlds by taking into consideration a preference for a better new record. Other team members might have other preferences, as in (22).

(22) Another member: Some of us walk very fast and find it easier to walk, so it’s not the case that everyone should run (/not everyone should run).

The team member that uttered (22) is committed to having left common ground assumptions. In particular, it is clear that there is still disagreement between the team leader and the other member about what to do. Overall, || [everyone run] || = \( \lambda w \forall x e \) is a running of x in w maps to True every accessible world in the subset the leader is thinking about, and maps to False every accessible world in the subset the other member is thinking about. Note that replacing should by have to in (22) also results in a true statement. This is because the accessible worlds should targets, in which || [everyone run] || is false, are a subset of the set of accessible worlds that have to targets. Although these judgments are harder to obtain if instead of periphrastic negation we use simply not in (22), I am tempted to conclude that SigW projects from under at least some negation operators.\(^6\)

To summarize, we have seen that SigW is projective not at-issue content which is not cancelable and not presupposed. The values of the modal parameters that SigW draws attention to are often new information and not intended as being anaphoric to previously introduced material. In the classification of projective meanings described by Roberts et al. (2009), these properties are compatible with SigW being a kind of independent speaker-anchored projective meaning (class B) or a kind of conventionally backgrounded projective meaning (class D). There are two reasons for concluding that SigW belongs in the latter class, with the properties highlighted in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>I. Projective</th>
<th>II. At-Issue</th>
<th>III. Informative</th>
<th>IV. Cancelable</th>
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<tr>
<td>A. Anaphoric</td>
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<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>B. Independent</td>
<td>global only</td>
<td>no</td>
<td>usually</td>
<td>no</td>
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<tr>
<td>C. Locally entailed</td>
<td>always local</td>
<td>no</td>
<td>often</td>
<td>yes</td>
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<tr>
<td>D. Backgrounded</td>
<td>always local</td>
<td>no</td>
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Table 1: Locating SigW within Roberts et al.’s (2009) classification of projective meanings (using the label Independent instead of Speaker-anchored for class B).

\(^6\)Should and have to come apart under negation if the team leader utters the following in response to (22). The negated weak necessity claim in (i) is perceived as a contradiction of the leader’s original position, (21), showing that the modal is evaluated with respect to the same premises as in the original non-negated weak necessity claim. The strong necessity modal does not show sensitivity to different interlocutors’ private assumptions (and It’s not the case that everyone has to run is true in light of joint assumptions in this conversation).

(i) Team leader: It’s not the case that everyone has to (/\( \not^2 \)should) run. But if we do all run, our time will be better.
Expressions in the class of conventionally backgrounded projective meanings are characterized by contributing at once both at-issue and not at-issue content. Examples include approximatives like *almost*, whose polar component seems backgrounded/assertorically inert/not at-issue and contrasts with its asserted/at-issue proximal component (Sevi 1998, Schwenter 2002, Horn 2002). Another example is *only*, whose prejacent and exclusive components have been diagnosed, respectively, as not at-issue versus at-issue content (Horn 2002, Roberts 2006). According to the proposal in (6), weak necessity modals also contribute both not at-issue (SigW) and at-issue meaning (necessity). Since they participate in the calculation of truth-conditional meaning, weak necessity modals are not “independent” in the way that items in class B, primarily parentheticals, appositives, and other triggers of Conventional Implicatures (CIs) in the sense of Potts (2005), are. It is on these grounds that von Fintel and Gillies (2010) conclude that a related not at-issue meaning of modals, namely the evidential signal of epistemic necessity modals, is not a class B-type meaning.7

Second, the requirement that *ought* relies on assumptions outside the common ground can be satisfied only in a local context. In (23a), the weak necessity modal highlights a preference for one of two options that would be viable given the change to modal parameters triggered by the *if*-clause. In (23b), there would only be one viable option in the local context, and the fact that *ought to* is degraded here with respect to *have to* is evidence that it cannot look to the global context for its interpretation.

(23) a. [There are three options for getting to the concert tonight: riding with John, taking a taxi, or taking a bus.] If John calls in sick, then you ought to take a taxi.
   b. [No bus goes to the concert venue, but there are two options for getting there: riding with John or taking a taxi.] If John calls in sick, then you have to (*ought to) take a taxi.

3 Multiple projective signals?

The discourse-oriented signal of weak necessity modals is detectable also under epistemic interpretations of these modals. In epistemic contexts, one reasons about ‘what is necessarily the case’ given some available evidence. While both strong and weak responses are possible in (24), the choice of *should* is appropriate when the speaker knows less about the person’s circumstances or plans and is filling in assumptions in order to derive the necessity claim.

(24) A: Why isn’t he here yet?
    B: I don’t know. He should (/must) be on his way.

Famously, epistemic modals – weak and strong – have been argued to carry another kind of projective signal. This signal contributes the information that the modal claim results from an (indirect) *inference* on

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7This meaning component is discussed in section 3 below. They write: “We are convinced that the signal cannot be a conventional implicature and is most likely a presupposition. One potential obstacle for a conventional implicature analysis is the feature of Potts’ system that prohibits the existence of expressions that contribute both to the “at issue” dimension of meaning (the standard truth-conditional semantics) and the conventional implicature dimension. But that is precisely what we need for epistemic *must*: it contributes standard modal necessity to the “at issue” dimension and furthermore comes with the evidential signal. By Potts’ logic, that evidential signal therefore cannot be a conventional implicature.” (ibid. p. 368).
the part of the speaker.\textsuperscript{8} It marks the source of information for the modal claim, and as such is also fitted within taxonomies of evidentials (Willet 1988, Aikhenvald 2004). Informally, the signal is described as follows.

(25) “the epistemic modal comes with a presupposition that neither the prejacent nor its negation is known through direct evidence or trustworthy reports”

(von Fintel and Gillies, 2010, 368)

We can detect this signal in (24) regardless of whether the necessity is expressed with a weak or a strong necessity modal. B’s response would be infelicitous had he had direct evidence for the claim, for example, had he actually seen the person in question stuck in a traffic jam.

Does this mean there are two different not at-issue signals that should sends off in (24)? There is some reason to think this is the case. The evidential signal of indirect inference pops up when a modal (any modal) is given an epistemic interpretation (26b), but is not present in non-epistemic contexts (26c). Moreover, von Fintel and Gillies (2010) observe that every epistemic modal in the languages they looked at carries an evidential signal of indirect inference (with both necessity and possibility epistemic modals, ibid. pp. 367, 369). They are forced to formalize the evidential signal of epistemic modals as a lexically specified presupposition, although they believe the recurring evidentiality must have a principled explanation (p. 368).

(26) [Seeing the pouring rain]
   a. It’s raining.
   b. ?It has to be raining.
   c. John has to take a taxi (in order not to get wet).

In contrast, we have seen that SigW is conventionally tied to just some modals (e.g., English ought to/should) and accompanies them in their various modal interpretations, epistemic and non-epistemic. I take this as evidence that SigW and the indirect evidence signal described in (25) are independent of one another. It seems plausible to look to the particular syntactic-semantic configuration in which epistemic modality is licensed in order to account for the tight link between the evidential signal and the expression of this modality. This remains an important task for future research, as von Fintel and Gillies (2010) conclude.

On the other hand, the “common ground novelty” signal of weak necessity modals (SigW) is more likely to be a conventionalized meaning component that is lexicalized in the denotations of a subset of modals. Still, it is necessary to ask if this signal might be related to other special properties of these modals. One such property that comes to mind is the obligatory future-oriented interpretation that has been claimed to characterize should, even in epistemic contexts such as the following (Copley 2006, Matthewson 2011).

\textsuperscript{8}This observation goes back at least to Karttunen (1972). Swanson (2008) notes: “[…] while ‘should’ and ‘must’ do both carry an evidential feature signalling inference, they can convey quite different attitudes on the part of the speaker toward the inferred conclusion” (p. 1203).
(27) John should be at home now.
   a. Context: John left your house half an hour ago and it takes him 20 minutes to get home.
   b. #Context: You have no idea what John has been up to today or what his general habits are, but
      you are driving past his house and you see his lights are on.

(Matthewson, 2011, 4(8))

Is SigW a by-product of future-oriented modality? The main challenge facing this hypothesis is the dis-
sociation found between future-orientation and modal “strength”. While future-oriented (e.g., teleological) should claims give off the weakness signal SigW, equally future-oriented (e.g., teleological) must or have to claims do not. The source of should’s future-orientation (and the question of whether it extends to ought to) needs to be worked out before the relationship between SigW and future-orientation is conclusively determined.

4 Conclusion

This paper was an investigation of the basic properties of a secondary meaning component of weak necessity modals, which was proposed to supplement the truth-conditional contribution of these modals as universal quantifiers over possible worlds. The secondary contribution was stated as a requirement that assumptions outside the common ground are entertained for the purpose of the necessity claim. These additional assumptions were shown to be of either a factual or a normative nature. They were also shown not to leave a mark on common ground assumptions.

Departure from common ground is a signal that is not part of the main points weak necessity modals make. It projects past entailment-canceling operators, but is not something that is presupposed in the discourse. Indeed, choosing ought to or should to make a necessity claim is a good first step in negotiating new information into the common ground.

I conclude with the hope that the multi-faceted semantics of weak necessity proposed here will offer fruitful grounds for evaluating theoretical claims about the semantics of secondary modal meanings (certain evidential contributions in particular), as well as the genesis and grammatical manipulation of projective meaning.

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References


1. Introduction

This paper presents the results of an experiment that tests a number of assumptions and predictions about projection behavior. We find that meanings hypothesized to be projective do in fact project, including projective meanings other than presuppositions. We also find that projective meanings display a great deal of heterogeneity, with some projecting much more than others and very few showing entailment behavior that is as robust as the entailment of assertions in a basic context. The degree of projection found with various triggers in this study is not consistent with many of the past theories of projective meanings, as discussed in section 4. The first section presents the relevant theories and background information, the second section presents the experimental method, and the third section presents the results.

1.1 Background on projection and problems with the identification of projection and presupposition

What is currently called projection in the semantics and pragmatics literature was originally taken to be a feature of definites and limited to survival under negation in Frege 1896. The observation was simple: both The king of France is bald and its contradiction The king of France is not bald required the king of France to exist. Later, the set of survival environments was expanded to include projection from questions, antecedents of conditionals, modals, etc., and called the Family of Sentences (FoS) tests in Chierchia and McConnell-Ginet 1990. Other projective meanings besides the were added to the canonical cases of projection, including factive verbs like regret, know, and discover; additive particles like too and again; cleft and pseudocleft sentences; aspectual verbs like stop; and verbs with a preparatory phrase, like win; inter alia. These meanings as a category were called presuppositions.

Projection was not the only hallmark of presuppositions; they were also said to be backgrounded, meaning that the prior context entailed whatever was being presupposed, as in early Common Ground (CG) approaches to the theory of presupposition (Stalnaker 1973, Karttunen 1974, Heim 1983). These two properties were taken to be related, and projection behavior became the diagnostic for presuppositions, which were in turn assumed to restrict the input context of a sentence containing said presupposition in a dynamic theory of semantics and pragmatics. Later, other diagnostics appeared, including the Hey Wait a Minute (HWAM) test of von Fintel 2004 (via Shannon 1976) and the attachment test of Jayez 2009 (via Ducrot 1972). In this paper, we consider only projection, which remains the most established metric.

There are two main kinds of problems for a theory that posits the co-occurrence of projection behavior and constraints placed on the common ground: the existence of meanings that project but do not seem to place constraints on the common ground, and the variability of projection within the category of meanings that do place constraints on the common ground. The study reported on in this paper addresses both of these questions by testing the projection of a variety of triggers, both within the class of
presuppositions and outside it. For an extended discussion of the first problem and its ramifications for a number of different kinds of theories of presupposition (common ground, anaphoric, etc.), see Simons et al. 2010. The basic idea is that conventional implicatures (CIs), as that category is construed by Potts 2005, are not required to be entailed by the common ground, so they are not presuppositions, but they are nevertheless projective. In fact, for some CIs, such as the non-restrictive relative clause in (1), one could argue that it is mentioned explicitly because the speaker does not think that it is information the hearer is likely to know already, directly contradicting the common ground requirement attributed to presuppositions. To see that this meaning projects, compare (1) to (2), where the assertion that the speaker's mother lives in Virginia is negated from (1) to (2) but the CI content that she is from Ohio is entailed by both.

(1) My mom, who is from Ohio, lives in Virginia.
(2) My mom, who is from Ohio, does not live in Virginia.

Chierchia and McConnell-Ginet 1990 first recognize the non-restrictive relative as a counterexample, but with the addition of Potts' work, the counterexamples multiply to include all kinds of phenomena, both supplements (appositives, etc.) and expressives (epithets, honorifics, etc.). In addition, Simons 2001, 2005 widens the group of counterexamples to conversational implicatures as well, as in (3) v. (4).

(3) A: Are we going on a picnic? B: It is raining.
(4) A: Are we going on a picnic? B: It is not raining.

In (4), the assertion of (3) that it is raining does not survive, but the implication that one should not choose to go on a picnic in the rain survives both sentences and is crucial to Gricean reasoning in both cases; the fact that rain is not good for picnics is the inference that makes B relevant to A in both cases. One could argue that, as world knowledge, the fact that rain is not good for picnics is already in the common ground, but this is still a counterexample to the idea that the category of presuppositions and the category of projective meanings are coextensive, because there are other reasons to believe that the inference from (3) and (4) is not a presupposition. Foremost among those reasons is the fact that the inference does not arise at all in a different context, i.e. without A, or in a case where A is 'Is it raining?', the association between rain and picnics does not arise in the first place, which is not true of many presupposition triggers, which are considered to have their presupposed content as part of their conventionalized lexical meaning. The fact that both conventional and conversational implicatures can project but do not share other properties of presuppositions means that (i) projection is not a test for presupposition exclusively, and (ii) theories of presupposition that tie its unique properties to the projection property will not be able to extend to the full range of meanings exhibiting projection behavior.

The second main kind of problem for the identification of presuppositions and projective meanings is that, simply put, not all presuppositions project in the environments where they are supposed to project. Simons 2001, Abbott 2006, and Abusch 2002, 2005 all cite factives like know as not always projecting. They say that while (5) entails both that Mary is pregnant and that John knows it, (6) doesn't entail either; it could simply be questioning whether John has evidence for this fact (while explicitly not believing that Mary is pregnant). Likewise, (7) entails that Jane is in NY, but (8) does not.

1 We contend that (6) typically requires a different intonational pattern on the reading that questions the basis of the knowledge rather than whether John believes what is in the propositional complement to begin with, but this will not
(5) John knows that Mary is pregnant.
(6) Does John know that Mary is pregnant?
(7) Henry will discover that Jane is in NY.
(8) If Henry discovers that Jane is in NY, there'll be trouble. [Simons 2001:9]

It is important to note that with some examples, projection does occur (as in the other reading of (6)), so it is not that these triggers have meanings that are strictly non-projective, but rather that their projection is not guaranteed across projection environments and different contexts. Schlenker 2010 calls such triggers “part-time” presuppositions and discusses only announce in detail. Here again, it is possible for the presupposition of announce, being a factive like know, to project, as in (9)/(10), where people will likely infer that Robert is fired, but it is also possible for it not to project, as Schlenker suggests people are not likely to infer that Robert will leave his wife in (11) or (12).

(9) Robert has announced to his mistress that he is fired.
(10) Robert has not announced to his mistress that he is fired.
(11) Robert has announced to his mistress that he will leave his wife.
(12) (Wisely), Robert has not announced to his mistress that he will leave his wife.

This is a slightly different argument than the one above because (11) doesn't entail the complement of announce in the first place. Simons, Abbott, and Abusch all focus on examples where triggers consistently entail their presupposition in the basic context but not under negation or other FoS environments. Schlenker says that, in addition, factive verbs don't necessarily entail their presupposed content even in the basic environment (though it certainly seems from what they say that the other researchers are aware of this as well and would agree). Because no general prediction is made about what kinds of discourse contexts would predispose a part-time trigger to project (as in (9)/(10) v. (11)/(12)), this is not an hypothesis that can be tested at this time, but we hope to address it in future research.

In addition to factive verbs, a number of other triggers are considered by Abbott, Abusch, and Simons to be part-time. These include change of state verbs like stop, as in (13) and (14), verbs with a preparatory phase like win as in (15) and (16), focus (as indicated by a pitch accent), and many others.

(13) Congratulations; you recently stopped smoking.
(14) I notice that you are chewing on your pencil. Have you recently stopped smoking? [Simons 2001:1]
(15) Alberto will win the 2003 Falmouth Roadrace.
(16) If Alberto wins the 2003 Falmouth Roadrace, he will have more Falmouth Roadrace victories than anyone else in history. [Abusch 2002:7c]

If all presupposition triggers were ‘part-time,’ it would still be a problem for a theory that identified projection in all contexts/FoS environments with other presupposition characteristics, but that would be a very different kind of problem from the heterogeneity of projection behavior. There are a number of triggers, however, that are said to always project across contexts and FoS environments, such as the cleft in (17) and (18) or too in (19) and (20), which creates a contrast with the part-time triggers.

be discussed further here.
(17) It was Nancy who broke the copier.
(18) It wasn't Nancy who broke the copier.
(19) Max went to the park too.
(20) Did Max go to the park too?

These robust triggers are called “hard” triggers by Abusch, while the part-time triggers are called “soft.” A number of further diagnostics are used to separate the different categories of triggers, including, most often, the notion of cancellation used with other implications. For example, the soft trigger in (21) can be canceled but the hard trigger in (22) cannot.

(21) I don't know that he loves me, and in fact, he may not.
(22) #It is possible that no one is going, but is he going too?

Thus, what we find here is that presupposition triggers are hypothesized to be a heterogeneous class with respect to projection. Regardless of their proposed reasons for the split, most authors agree that there are two basic categories. Heterogeneity within those categories is not discussed; the important point is that within the category of meanings that are projective at all, some are projective all the time and others only sometimes (except for places that theories of projection predict should block all projective meaning, such as in contexts that are aptly named plugs). There are some triggers that are not explicitly included in either group or where there is disagreement among authors. For example, Abusch 2005 suggests that the definite article is a soft trigger, following others’ observations that it is cancelable, as in (23), but it is not given an explicit analysis along those lines by any of the authors. In fact, Abbott 2006 contends that it is in fact a hard trigger and that the cancellation in (23) is actually an instance of metalinguistic negation.

(23) It's not true that Joe's girlfriend does not like his children, because he has none.

Similarly, most authors focus on presupposition triggers, though Abbott hypothesizes that all CIs are hard triggers and Simons 2001 indicates that some of the projective conversational implicatures could be treated in the same way as the soft triggers. In the next subsection, we look more closely at the predictions of some of these proposals and discuss how that informs the design of our experiment.

1.2 Attempts to solve the problems of projection heterogeneity and predictions

As we saw above, the first problem for most theories of presupposition and projection is that some projective meanings are not presuppositions, in that they do not carry requirements that their content be entailed by the common ground. Simons et al. 2010 propose that a distinct feature is relevant for projection: whether a meaning is at-issue. Roughly, meanings \( p \) are at-issue relative to a question under discussion (QUD) if the question of whether \( p \) is relevant to the QUD (where a question is relevant to the QUD if it entails at least a partial answer to the QUD). Specifically, it is hypothesized that only not-at-issue meanings project because operators such as negation, modals, etc. target only the at-issue content of sentences. Simons et al. revise this to include the speaker's intention to address the QUD to account for a

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2 Jayez 2010 has another interesting proposal based on the non-attachment of clauses to projective meanings, which he compares to an earlier version of Simons et al.’s proposal, but for reasons of space, we will only discuss the most recent theory here.
handful of interesting examples, but the point here is that the at-issueness feature does in fact unify the categories of presupposition, CIs, conversational implications, etc., in that regardless of whether a constraint is placed on the common ground, none of them are normally used to address the QUD. Though Simons et al. mention the possibility that various triggers may not be simply conventionally specified as being or having not-at-issue content, because the concept of at-issueness is binary and linked to projection, there are only two categories: projection / not-at-issueness or non-projection / at-issueness. Thus, if this theory were to be extended to the second problem to account for different levels of projection, it would either need to be the case that, in the cases where expected projection does not occur with a ‘part-time’ trigger, the meaning that is normally not-at-issue becomes at-issue, or, possibly, that there is a further distinction made in terms of degree of at-issueness, where, perhaps, partial answers to the QUD are less at-issue than complete answers to the QUD (though it would still need to be demonstrated that in the cases where projection of a presupposition does not occur, those are the same cases where the trigger is a partial answer rather than completely irrelevant to the QUD). The following, then, are some of the predictions of this theory:

(24) Predictions of Simons et al. 2010
   a. Both projective and non-projective meanings are entailed in basic (non-FoS) contexts.
   b. Projective meanings are entailed in FoS contexts (this is their basis for being projective).
   c. Non-projective meanings are not entailed in FoS contexts.
   d. Projective meanings include anything not-at-issue, specifically including both presupposition triggers and CI triggers (inter alia).
   e. As long as they are both not-at-issue, presuppositions and CIs should project equally (there is no basis for a difference in projection between them in not-at-issue contexts).
   f. If a normally projective meaning happens to be at-issue, it should not project.
   g. If a normally non-projective meaning happens to be not-at-issue, it should project.

The study presented here will test (24a)-(24e) with one caveat: stimuli were not presented with a QUD, which limits certainty with respect to (24e) if some of the triggers tested are not lexically specified as having the projective meaning in question be not-at-issue. However, many of the contexts that give rise to cases that would test (24f) and (24g) (and would thus be exceptions to the general rule that presuppositions and CI meanings are, by default, not-at-issue, etc., which would have repercussions for (24e)) are very particular, so we take it to be unlikely that our stimuli tested these non-default cases. In sum, the results of our experiment will address the questions of whether projective meanings do in fact project, whether they differ in that regard from meanings we take to be non-projective (such as basic assertions of a sentence), whether both CIs and presuppositions project, and whether CIs and presuppositions project to the same degree.

Turning now to theories designed to solve the second problem, there are many to choose from, including Simons 2001, van der Sandt and Geurts 2001, Abbott 2006, Abusch 2002, 2005, 2010, and Schlenker 2010. Although there are a number of specific differences across these theories, as discussed below, they all share a number of predictions, including the following:

(25) Predictions of ‘projection heterogeneity’ theories
   a. Some triggers project across all contexts and FoS environments (‘hard’ triggers), including cleft sentences and additive particles like too.
   b. Some triggers do not project in certain contexts and FoS environments (‘soft’ triggers), including
factuals like know (most authors also agree that aspectual / preparatory phrase verbs like stop and win are soft triggers, but they are not specifically mentioned by all authors).

Both of these predictions will be tested by this study. We will examine not only the questions of whether some triggers are more projective than others (and whether any across the board), but also whether the individual triggers match the categories proposed for them in the cases of the cleft sentence, know, and win. We now turn to a discussion of the predictions of individual theories.

Abusch 2002, 2005, and 2010 proposes that hard and soft triggers have different bases. Hard triggers, she says, are lexically specified with their presuppositional content, which is why that content always projects (i.e., because it is inalienable). Soft triggers, on the other hand, are argued to have a presupposition that is derived only indirectly from the semantics of the triggers. She shows that, in many cases, soft triggers have already been proposed as having an alternative semantics and that a default constraint can derive a presupposition on the basis of the disjunction of those alternatives. For example, a question like (26) is said to presuppose that someone took Mary's bike, but this presupposition is defeasible (making it a soft trigger). The semantics for that question is assumed to be a set of propositions of the form ‘x took Mary's bike’, where x ranges over individuals. Thus, Abusch 2010 says, it would be easy to derive the default presupposition of this question by taking the disjunction of that set (= someone took Mary's bike). Her default constraint (in its simplest form) appears in (27).

(26) Who took Mary's bike?
(27) Default Constraint L: If a sentence S1 is uttered in a context with common ground c, and S1 embeds a clause S2 which contributes an alternative set Q, then c is such that the corresponding local context d for S2 entails the disjunction of Q.

We know from the previous section that this will not be able to generalize to a solution of the first problem because the default constraint makes reference to the common ground, which is not a requirement of CIs, etc. However, one might think that this constraint could be reworded in accordance with a notion of at-issueness, etc., and that the main point is simply that, because this is merely a default constraint, it can be violated. In cases where it is violated, projection does not occur, which is the basis of the solution for variable projection behavior among triggers. As for other soft triggers such as know or win where an alternative semantics is less viable, Abusch offers several possible solutions, including positing a different default constraint that is not based on alternatives for other soft triggers, as well as a sketch of a way in which one could make verbs with preconditions trigger certain alternative sets so that they could then be constrained by L just as other soft triggers are. Because this work does not include a discussion of what would override the default, it is not clear whether Abusch's work predicts heterogeneity within the category of soft triggers, but it does clearly predict that soft triggers will project less than hard triggers (and that hard triggers should not be defeasible).

Whereas Abusch gives a split solution in that hard triggers encode presuppositions lexically (or constructionally) while soft triggers do not (and presuppositions arise on the basis of a feature of the semantics along with the default constraint, which is a slightly more pragmatic solution than that posited for hard triggers), other authors typically posit either that all presuppositions are encoded lexically and that the hard/soft difference is related to something else (e.g. van der Sandt and Geurts 2001) or that all presuppositions arise from a pragmatic reasoning process (so that none are encoded lexically) and the hard/soft difference is related to something else (e.g. Simons 2001). Among theories that try to derive presuppositions conversationally, there are a variety of approaches. Simons 2001, following a suggestion
of Stalnaker 1973, proposes that a presupposition q arises when the question of whether p (where p is the assertion, etc.) would not come up if the speaker didn't believe that q. For example, you would have no reason to ask whether Kathleen knew that Elizabeth moved to Chicago if you did not believe that Elizabeth had moved to Chicago. Simons argues that all FoS environments serve to raise the question of whether p. For example, both Elizabeth moved to Chicago and Elizabeth did not move to Chicago offer answers to the same question: Did Elizabeth move to Chicago? For her approach to work, there also needs to be an interpretation principle that relates p and q in the way noted above. Simons gives one, shown here in (28).

(28) Suppose that P entails but is not entailed by Q. A speaker who raises the question whether P indicates a belief that Q is true.

So far, this analysis gives a conversational basis for presupposition projection, and it is not limited to the CG, etc., so it could be extended to CIs and other kinds of meanings. However, what it does not do at this point is explain why soft triggers do not always project. Though Simons spends a good deal of time in the article giving data to show that these meanings do not always project, this issue is left for future work in her theory, so she does not make additional predictions about projection behavior.

Schlenker 2010 follows a related notion of Stalnaker 1973's that presuppositions can be conversationally derived. In this case, it is reasoned on the basis of cooperativity that a speaker would not utter the sentence *x knows that p* in a context where p was disputed because then the point of the utterance would not be clear; it could be either to assert that p by pointing out that it is known or to convey information about who knows it, etc. Schlenker calls a situation in which both contributions would be possible a case of having two heterogeneous contributions of an utterance. He argues that a contribution of an expression d to the meaning of a sentence should be viewed as the difference between the local context of d and the update of that local context with d (the notion of local context itself has a technical definition, and the notion of a local meaning is the meaning that an expression has relative to its local context). He claims that presuppositions arise (and project) in cases of heterogeneous contributions and that if two expressions have the same local meaning, they trigger the same presupposition. Schlenker further claims that this theory predicts that some expressions could trigger a presupposition when they appear in some local contexts but not others since the local meanings are what determine projection and the local meanings are based on the local contexts. Though he discusses part-time/soft triggers, he, like Simons, does not flesh out a full theory.

Finally, in the case of Abbott 2006, the generation (and projection) of a projective meaning is related to the property of neutralization / neutralizability, phrased in terms of nondetachment, where a meaning is neutralizable if and only if it is nondetachable and where projection co-occurs with non-neutralizability / detachment (she attributes the basis of this hypothesis to be a remark of Ladusaw's). The idea is that if a sentence can be reworded in a way that eliminates the presupposition, it is detachable. This is the case for the cleft in (29), which can be reworded as in (30) with the presupposition eliminated. Thus, it is detachable and therefore not neutralizable, and therefore always projective.

(29) It wasn't Sue who solved the problem. [Abbott 2006:38a]
(30) Sue didn't solve the problem. [Abbott 2006:38b]

In the case of *win*, on the other hand, there is no way to reword a sentence to mean that someone won something without using the word *win* and having its sometimes-projective meaning present, so it is
nondetachable, neutralizable, and therefore not necessarily projective. There is no reason to think that, in a theory like this one, different soft triggers that are nondetachable would have different projection properties from one another. Once again, however, we see a clear prediction of a difference between hard and soft triggers. In addition, Abbott notes that there is variation among factive verbs such that some seem to be hard triggers (like *regret*), while others are soft (like *discover* and *know*). She acknowledges that this is a problem for her theory and other theories, because these are predicted to be uniform.

In sum, we have seen in this section a variety of approaches to the various problems of projective meaning, many of which yield similar predictions via different approaches. We have also seen that many more predictions are just around the corner as these and other theories continue to be fleshed out. (31) summarizes the primary predictions of these theories that are tested by the experiment described in the next section.

(31) Predictions

a. Projective meanings differ from non-projective meanings in that the former should project in FoS environments while the latter should not.

b. Projective entailments should project just as much in basic environments as in FoS environments. (That is, projection is complete.)

c. Presuppositions and Conventional Implicatures, both being types of projective meanings, should project equally in FoS environments (though if presuppositions include both hard and soft triggers and CIs are uniformly hard triggers, we may expect CIs to project more as a category).

d. Within presuppositions, if there are differences in degree of projection, hard triggers (cleft sentences) should be associated with a greater degree of projection in FoS environments than soft triggers (*win*, *know*).

In order to test these predictions, we compare a variety of triggers, including CIs, hard presupposition triggers, and soft presupposition triggers. In addition, we test two types of CIs to see whether there is a difference between them as well as two different soft triggers and the definite article *the* because its categorization is contentious. In addition to a variety of triggers, we need to test a variety of conditions; namely, those in (32).

(32) Four test conditions

a. Non-projective entailment in a basic environment

b. Non-projective entailment in an FoS environment

c. Projective entailment in a basic environment

d. Projective entailment in an FoS environment

Comparing conditions (32a) and (32c) will test whether projective and non-projective meanings are entailed in basic positive sentences (and to the same extent). Comparing conditions (32a) and (32b) will test whether non-projective meanings are in fact not projective in FoS environments (this could also be tested via a comparison of (32b) and (32d)). Comparing conditions (33c) and (33d) will test whether projective meanings are in fact projective, but comparing these conditions across triggers will also answer the questions from (31c) and (31d) with respect to projection heterogeneity.

2. Experimental Methods
In order to test these predictions, we carried out an experiment to examine the projection behavior of different kinds of projective meanings. Briefly, participants were presented with stimulus sentences and asked to judge how surprised they would be to learn something related to the stimulus sentence; essentially, whether a hypothesized projective meaning did in fact project. Details of the methods of this experiment are given below.

2.1 Procedure

The entire experiment was conducted online at a participant’s own convenience using the commercial survey design tool “Survey Monkey.” A participant enrolled in the experiment by logging onto a website (experimetrix) that served as a portal to all departmental experiments at the first author's institution, where they retrieved a URL and code to access the experiment. In the instructions, participants were told that they would have to read a sentence and answer three questions about it. They were instructed to pretend that the sentence they read was something that they had overheard and that they could assume that the person who hypothetically said the sentence was talking to someone else rather than to the participant directly. They were also told to assume that the person who said each sentence was well informed and was telling the truth as far as he or she knew it. They were told that they would then be asked how surprised they would be to learn hypothetical things about the content of the sentence on a scale of 1 to 5, where 1 represented “I would be not at all surprised,” 3 represented “I wouldn’t be either surprised or unsurprised,” and 5 represented “I would be extremely surprised.” Participants were told that there were no right or wrong answers to these questions, but they were asked to answer each question independently of the others; that is, they were told not to base their response to one question on information contained in another question. They were given an example and walked through an appropriate interpretation and response before beginning the actual experiment.

On each trial, a single sentence appeared at the top of the screen in bold. Below this, the line “How surprised would you be to learn that...” appeared, followed by three questions. In test trials, one of the three questions was the question of interest, testing the interpretation of the entailment in question, while the other two questions were distracter questions asking about other aspects of the sentence or real-world knowledge related to the sentence content, so as to draw participants’ attention away from the issue of entailments. In filler trials, all three questions were distracters. Each question was accompanied by a five-button scale, labeled as indicated above; participants clicked on the button in each scale that represented their response to that question. After answering all the questions for a given trial, the participant clicked “Next” to move on to the next trial.

2.2 Stimuli

Six different types of projective meanings were tested in this experiment: two conventional implicatures (expletives and appositives) and four presuppositions (the, which, as described above, is not consistently classified as being either hard or soft; a hard trigger, the cleft construction; and two soft triggers, win and know). There were two different kinds of environment that each projective meaning could be placed in, a basic environment (i.e., an environment in which all meanings should be available, as in Jamie broke the copier in which both the non-projective entailment that ‘Jamie broke the copier’ and the projective entailment ‘the copier exists’ are available) and an FoS environment (i.e., an environment in which only projective meanings should be available or project). We used two different FoS environments, negation (e.g., Jamie didn’t break the copier) and antecedents of conditionals (e.g., If Jamie broke the copier,
Larry will be mad), for a total of three different possible environments (basic, negation, and antecedent of a conditional). We also made use of two different polarities in designing the stimulus questions, so that participants would not always be answering the questions in the same direction; that is, the response question was phrased in the positive half of the time (e.g., “How surprised would you be to learn that Jamie broke the copier?”) and in the negative the other half (e.g., “How surprised would you be to learn that Jamie didn’t break the copier?”). Thus, there were 36 basic stimulus combinations (6 projective meanings x 3 environments x 2 polarities). Each participant experienced each of these 36 combinations once; these parameters were within-participant.

In addition, there was a between-participant parameter of whether a particular entailment was stated as a projective meaning or a non-projective meaning. For example, the same entailment “Jamie broke the copier” could be stated as a simple, non-projective meaning (e.g., Jamie broke the copier) or as a projective meaning (e.g., I know that Jamie broke the copier). We wanted to be able to use the exact same entailments in both the projective and non-projective forms, so we created two versions, “A” and “B,” of the experiment, each containing half projective and half non-projective versions of the 36 stimuli, with the projectivity of each version being complementary (i.e., each version contained only the projective or the non-projective version of a particular entailment). Each participant saw only one version of the experiment and thus experienced each specific entailment in only one condition.

Recall that there are four basic conditions that we were interested in testing, as shown in (32), repeated from above:

(32) Four test conditions
   a. Non-projective entailment in a basic environment
   b. Non-projective entailment in an FoS environment
   c. Projective entailment in a basic environment
   d. Projective entailment in an FoS environment

Conditions (32a) and (32c) were thus “paired” across versions, as were conditions (32b) and (32d). That is, the same entailment was tested in condition (32a) and (32c), but as either a projective or non-projective meaning across the two versions of the experiment. Across environments, different entailments were tested to minimize the number of different versions of the experiment needed.

In addition to the 36 test sentences, there were 8 filler sentences in which all three questions were distracters and nothing about the entailments of the sentence was tested. The two versions of the experiment were each pseudo-randomized the same way, so that participants saw the entailments in the same order in each version. Each version started and ended with a filler trial. Test trials were randomized according to the following constraints: no two adjacent trials involved the same type of projective meaning; no two adjacent trials involved the same type of environment; no more than two adjacent trials had the same polarity of target question; and no more than two adjacent trials had the same entailment type (projective vs. non-projective). The polarity of the distracter questions was also varied, but was not controlled for in the randomization. In total, then, participants each experienced 44 trials and answered a total of 132 questions. Participants reported that the experiment took them between 10 and 45 minutes to complete, with an average of 29 minutes.

After the data had been collected, it was discovered that there was an error in one of the stimuli containing expressives, and it had to be removed from analysis. We have included the results for all of the correct data below, but we do not examine the difference between the two types of conventional implicatures in any detail here because we think that the inequality in the number of stimuli for
expressives as compared to appositives may have a spurious effect on the results.

2.3 Participants

A total of 65 participants took part in the online survey, 35 in Version A and 30 in Version B. 12 participants were removed from analysis for various reasons: they were not native English speakers, they did not finish the experiment, or they stopped using the Likert scale in a reasonable manner (one participant responded to all questions with ‘3’ after the first few stimuli). Therefore, 53 participants’ data were analyzed in total, 26 in Version A and 27 in Version B.

All 53 were undergraduate students at Northwestern University and received course credit for participating in the experiment. All 53 were native English speakers, though 7 were natively bilingual in English and another language (2 in Spanish, 2 in Urdu, and 1 each in French, Arabic, and Chinese). Of the non-bilinguals, all but 7 claimed at least some knowledge of a language other than their native language. 37 were female; 16 were male. The participants ranged in age from 17 to 22, with an average age of 19.45. Of the 53 participants, 36 had taken at least one linguistics course at Northwestern; only 8 had taken more than one course. In a post-experiment follow-up questionnaire, only 6 of the 53 showed any indication of correctly guessing the purpose of the experiment as having something to do with drawing implications from sentences.

3. Results

The responses of participants who saw Version A and those who saw Version B can be collapsed into a single set of responses because the questions of interest are about general categories such as “projective meaning type,” “environment,” and “entailment type,” rather than the specific entailment type present for any individual sentence. Furthermore, we did not have any reason to believe that the polarity of the test question would have any substantive effect on the judgments of projection behavior; that is, we expected that participants would show projection by responding in equal but opposite ways to positive and negative polarity questions. To be able to collapse the responses of all participants and both polarity types, we normalized the responses of each participant using a z-score normalization, to ensure that all participants’ responses were in the same dimensionality (i.e., to avoid complications by participants who tended to use one part of the scale or another, or avoided the endpoints, etc.). We normalized the responses to positive and negative polarity target questions separately, first inverting all of the responses to the negative polarity target questions so that they were in the same direction as the responses to the positive polarity target questions, and then collapsed the normalized responses across the polarities.

These normalized results are shown in Figure 1. Each group of four bars represents one of the six projective meaning types. Within each type, the bars represent each of four conditions, from left to right: non-projective (“simple”) entailment in a basic environment; non-projective entailment in an FoS environment; projective entailment in a basic environment; and non-projective entailment in an FoS environment. In this graph, zero is a lack of surprise in either direction, bars less than zero show that participants were actively not surprised, and bars greater than zero show active surprise. We have inverted the positive and negative numbers in the graph so that bars above the center line show projection.
Recall the predictions from §1.2 (in (31)). Prediction (31a) is tested by comparing the second and fourth columns in each set of four in Figure 1. The expectation is that if projective entailments in FoS environments (column 4) do in fact project, the average response to them should be significantly less than zero (above the line)—this would indicate that participants said they would be significantly not surprised to learn that the entailment were true. If non-projective entailments in FoS environments (column 2) do in fact not project, then the average response to them should be significantly greater than zero (below the line), indicating that participants said they would be significantly surprised to learn that the entailment were true. Each of these can be tested by using one-sided t-tests, collapsing over the different projective meaning types. The predictions were met; projective entailments in FoS environments are significantly less than zero \(t(316) = -7.464, p < 0.001\) while non-projective entailments in FoS environments are significantly greater than zero \(t(317) = 20.9956, p < 0.001\). Projective and non-projective meanings are therefore significantly different from each other as well \(t(615.213) = 20.8733, p < 0.001\).

Prediction (31b) is tested by evaluating whether there is a difference between the third and fourth columns in each set of four in Figure 1. The expectation is that projective entailments should be equally unsurprising in both basic environments and environments in which they project while non-projective entailments are not (i.e., in FoS environments), and thus both the third and fourth columns should be significantly less than zero (above the line) and not significantly different from one another. Because this is a comparison between two averages, an F test for equal variances was done first, followed by a t-test to compare the averages. The F test revealed no significant difference in the variances of the two means \(F(314/316) = 0.9155, p = 0.43\), so a basic two-sample t-test was used and revealed that there is a significant difference between projective entailments in basic and in FoS environments \(t(630) = 6.2679, p < 0.001\). Specifically, collapsing across the different kinds of projective entailments, participants indicated they would be less surprised to learn that a projective entailment were true in a basic environment than they would be to learn that it were true in an FoS environment. In other words, even
though projective entailments do project in FoS environments (unlike non-projective entailments), they are in fact weakened by FoS environments as well. As can be seen in Figure 1, this weakening seems to occur more with some projective entailments than with others, as will be tested more specifically below.

The third prediction, (31c), is tested by comparing the fourth columns in the first two sets of four bars (the results for conventional implicatures) to the fourth columns in the last four sets of four bars (the results for presuppositions). The expectation is that regardless of whether a projective entailment is a CI or a presupposition, participants should indicate that they would not be surprised to learn that it was true in an FoS environment; the responses should both be significantly less than zero (above the bar), as seen above, and not different from one another. An F test for variance showed that the responses for CIs and presuppositions did not differ in their variances \(F(104/211) = 1.2097, p = 0.2493\), so a standard t-test was used. The t-test showed that, as predicted, there was not a significant difference between responses to CIs and presuppositions in FoS environments \(t(315) = -1.7211, p = 0.086\).³

The fourth prediction, (31d), is tested by comparing the fourth columns of each of the sets of four bars that show responses to the various types of presupposition triggers; that is, comparing the degree of projection in cleft sentences to that in win and know sentences. First, we test to see whether responses to each of the soft triggers (win and know) were different from one another; an F test revealed no significant difference in the variances \(F(52/52) = 1.1329, p = 0.6544\), and a t-test revealed that the responses to these sentences in FoS environments were also not significantly different \(t(104) = 0.1914, p = 0.85\). Thus, the two soft triggers seem to project equally to each other in FoS environments. Comparing the hard trigger to the combined soft triggers, an F test revealed a significant difference in variance \(F(52/105) = 1.6527, p = 0.03\) (not surprising, because there were two soft triggers and only one hard trigger), so a conservative Welch’s t-test was used. This showed that there is not a significant difference between the responses to the cleft as a hard trigger in FoS environments and those to win and know as soft triggers in FoS environments \(t(84.398) = 1.5974, p = 0.11\), which is already surprising. Notice further, however, that the trend is in the direction opposite to that expected if there were a difference between them; the soft triggers show a greater degree of projection than does the hard trigger (though as reported, this difference is not statistically significant in this dataset).

Perhaps even more surprisingly, the hard trigger tested here (the cleft sentence) does not actually show any significant degree of projection in FoS environments; a one-sample t-test reveals that responses to the cleft in these environments were not significantly different from zero \(t(52) = 0.046, p = 0.52\). It should be noted that while this is different from the results for the non-projective entailments, which were actually canceled or called into question by the FoS environments as indicated by average responses significantly greater than zero, it is also different from the results for the soft triggers, which show projection by having average responses significantly less than zero \(t(105) = -3.2309, p < 0.001\). That is, these results indicate that participants would be neither particularly surprised nor unsurprised to learn that a projective entailment from a cleft sentence were true, rather than being particularly unsurprised as would be expected if the cleft does in fact act as a hard trigger.

On the other hand, the unclassified trigger the does show significantly different behavior than that of either the cleft sentences or the soft trigger sentences with win and know in this environment. There is a

³ Note that it is possible that the smaller number of stimuli in the CI-Expressive condition (described in §2.2) is affecting this result. Given that the prediction is that CIs and presuppositions on the whole shouldn’t differ from each other in terms of projection in FoS environments, and this is what is found even with the missing data, we feel that it is worthwhile to report. This result in particular does, however, need to be verified with further experimentation.
greater degree of projection in the sentences in FoS environments than there is with either the cleft [Welch’s t(89.54) = 4.7049, p < 0.001] or with the soft triggers [t(157) = -4.1953, p < 0.001]. In other words, the is behaving the way we would have predicted a hard trigger to behave as compared to the soft triggers. Thus, there are differences in the degree to which the various presuppositions actually project in FoS environments (as foreshadowed by the fact that the degree of projection is lower overall in FoS environments than it is in basic environments; see prediction 2 above). The shows the greatest degree of projection, followed by the soft triggers win and know, followed surprisingly by the hard trigger cleft sentences (though the last difference, between soft triggers and the cleft, was not statistically significant).

4. Discussion

The results in §3 are both surprising and unsurprising. On the one hand, we have validated linguists’ intuition that projective meanings do project as compared to non-projective meanings. We have also validated the fact that non-projective meanings are significantly different in basic and FoS contexts because they do not project in FoS contexts. On the other hand, it is somewhat surprising that non-projective meanings do not project equally in basic and FoS contexts—projection does not appear to be complete. Instead, even though projective meanings do project in FoS contexts, they do so to a lesser degree than they do in basic contexts, indicating that their projection is somehow weakened by being in an FoS context.

It is also not surprising that we found heterogeneity among triggers with respect to projection behavior. The particular heterogeneity, however, was surprising, in that the cleft, as a hard trigger, projected less than win or know as soft triggers. We also found that the definite article was the most projective of the presupposition triggers, making it clearly a hard trigger if hard triggers are to be identified solely on the basis of robust projection. The non-restrictive relative clause environment was similarly robust, supporting the idea that at least appositives are hard triggers as well.

Finally, though the conclusion that CIs and presuppositions are not significantly different as categories is somewhat premature, the fact that no such difference was found suggests that theories treating them on a par are on the right track. Certainly, both are projective, requiring theories along the lines of Simons et al. 2010. Similarly, it is clearly the case that projective meanings, while unified by projection, differ with respect to the degree to which they project, requiring further work on this issue, especially since the apparent behavior of the triggers only partially lines up with the categories of hard and soft proposed in the literature.

These results are preliminary and should be replicated with further materials and testing. One particular issue is that the specific lexical content of any stimulus sentence may have an impact on the degree to which a given meaning projects. For example, there seem to be differences among the responses to non-projective meanings in basic environments (the first bars of each set of four in Figure 1), which are unexpected because these sentences did not include the target projective meaning type (the, win, know, etc.) in them and were designed to be equivalent. There also seems to be a trend for projective meanings to be not as readily entailed (or judged to be non-surprising) as non-projective meanings in the basic environment (comparing the first and third bars of each set of four). This requires further work, especially work that includes prior utterances in addition to those tested since it is possible that people are judging presuppositions in particular as being less robust because they must be accommodated.

In summary, we have shown clear experimental evidence for the difference between projective and non-projective meanings using the Family of Sentences test and shown that presuppositions are not the only type of projective meaning. Furthermore, we have shown that there is heterogeneity among
projective meanings, though the specifics of this heterogeneity call into question certain assumptions that have been made in the literature about the differences between “hard” and “soft” triggers.

5. References


Correlation between Presupposition Projection and At-issueness: An Empirical Study

Jingyang Xue    Edgar Onea
Courant Research Centre “Text Structures”
University of Göttingen, Germany

Summary
In this paper we first experimentally show that presuppositions triggered by different triggers come with different probabilities to project. We argue that this variation is related with the distinction between at-issue and not-at-issue content (cf. Simons et al. 2010). We support this claim with a follow-up experiment showing that the not-at-issueness of a presupposition correlates with the projection probability observed in the first experiment.

1. Introduction
The ability to project, i.e. the ability to survive under an entailment-cancelling operator such as a conditional, modal or negation operator (Simons et al. 2010), has been regarded as a defining property of presuppositions (Langendoen and Savin 1971, Karttunen 1973, Chierchia and McConnell-Ginet 1990). The traditional tests for the identification of presuppositions, the Family of Sentences Tests, are in fact projection tests. However, it has also been observed that presuppositions do not always project. For example, the aspectual verb *to stop* is commonly regarded as a presupposition trigger. As in (1a), *to stop* triggers the presupposition that Peter used to smoke. Normally, this presupposition projects and the whole sentence gives rise to the inference that Peter used to smoke, although the trigger of this presupposition *to stop* is embedded under the scope of the negation. However, this presupposition need not to project. As shown in (1b), the presupposition is denied in the second sentence directly and hence indicating that the first sentence does not presuppose the previous smoking habit of Peter at all. In this case, the presupposition fails to survive under the negation operator, and hence doesn’t project.

(1) a. Peter didn’t stop smoking.  
   b. Peter didn’t stop smoking. He never smoked!

If a presuppositional inference doesn’t project, it is sometimes said not to be a presupposition at all. In this paper we will not go into this terminological issue. For the sake of convenience we will refer to the

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inference which a presupposition trigger gives rise to as a presupposition, irrespective of whether it projects or not. Examples like (1) show us at least two points: a. Presuppositions triggered by the commonly recognized triggers don’t have to project. b. Whether a presupposition projects is not totally determined by the sentence containing the trigger itself but also determined by the context. The same presupposition triggered in the same sentence can show different projection behavior according to the context.

It has been observed that not all presuppositions project equally: presuppositions triggered by some triggers seem to show less stable projection behavior than others (Karttunen 1971, Simons 2001, 2007) Presupposition triggers are sometimes divided into “hard triggers” and “soft triggers” (Abusch 2002). The question which we are interested in here is firstly, how different are the triggers? And secondly, how can the differences in projection be explained?

Recent works by Roberts et al. (2009) and Simons et al. (2010) suggest that the fact that certain meaning projects can be attributed to its not-at-issueness in a context. If they are right, we should be able to observe differences in the at-issueness of presuppositions triggered by different triggers. In this paper we will show two pilot experimental studies which aim at testing projection behavior of presuppositions and testing at-issueness of presuppositions. Our findings support the hypothesis that the at-issueness of presuppositions may determine the projection behavior.

This paper is structured as follows: In section two, we briefly review three approaches which can be used to account for not-projecting presuppositions. Section three deals with differences in projection behavior of presuppositions triggered by different triggers. We provide some new experimental data showing the differences between four German presupposition triggers: wissen (‘to know’), erfahren (‘to find out’), auch (‘too’) and wieder (‘again’). In section four we present another experimental study which investigates the at-issueness of presuppositions triggered by the four triggers. In section five the conclusion will be made.

2. Existing accounts for not-projecting presuppositions

The evidence that presuppositions may not project poses a problem to the classical conception of presuppositions as preconditions for meaningfulness of an utterance (Frege 1892, Strawson 1950). Many attempts have been made to account for the puzzle of not-projecting presuppositions. We will first review two accounts which may solve the problem of not-projecting presuppositions via pragmatic presupposition and local accommodation respectively. Then we will review a recent account for projection using the notion at-issueness.

2.1 Pragmatic presupposition

A kind of explanation that deals with the problem of not-projecting presupposition is to say that (at least some) presuppositions are from pragmatic sources (Stalnaker 1973, 1974, Chierchia and McConnell-Ginet 1990, Simons 2001, 2007 among others). According to this view, presuppositions don’t have to be a
hard-wired component of the semantics of the triggers, but they may be triggered conversationally, i.e. they are derived from general conversational principles which also give rise to conversational implicatures. Pragmatic presuppositions refer to the set of beliefs by the speaker about the Common Ground in conversation. Examples like (1b) are regarded as evidence that presuppositions are “defeasible”, a property which presuppositions share with conversational implicatures. According to the pragmatic account, to stop doesn’t trigger semantic presuppositions but it can give rise to pragmatic presuppositions. In a normal situation, the speaker of the sentence (1a) would presuppose that Peter used to smoke and the hearer can reasonably recognize that the speaker is presupposing that. But if the speaker utters (1b) he or she obviously does not take it for granted that Peter used to smoke, and the hearer has no reason to assume that the speaker is presupposing this, because otherwise the speaker would be inconsistent.

A similar approach attempts to resolve the problem with a mechanism of presupposition “cancellation”. According to Gazdar (1979a, 1979b), a presupposition trigger can only generate a potential presupposition of the sentence containing the trigger. This potential presupposition may but doesn’t have to become an actual presupposition. If the potential presupposition is inconsistent with assumptions that are already in the context or in conflict with some conversational implicatures, the potential presupposition is canceled.

2.2 Local accommodation

The second kind of explanation assumes that presuppositions are always triggered by their triggers on a conventional basis and they must be satisfied (Karttunen 1974, Heim 1983, von Fintel 2004, 2008 among others). According to this view, the fact that presuppositions don’t always project can be accounted for by local accommodations. If the presupposition triggered by a trigger is not already satisfied by the local context, then this inference must be accommodated. A sentence containing only one entailment-cancelling operator involves both a global context, i.e. the Common Ground, and a local context, the context embedded under the operator. Since the local context is embedded, the content in it has to be interpreted with respect to the embedding operator. For example, in (2a) there are two possible sites for the presuppositional inference “John has a girlfriend” triggered by his girlfriend to be accommodated: the global context \(c_1\) and the local one \(c_2\) (cf. Beaver and Zeevat 2007). If we accommodate the inference globally in \(c_1\), namely outside the scope of \(if\), we will obtain the reading in (2b). In this case the presupposition certainly projects. If we choose the option of local accommodation, i.e. to accommodate in \(c_2\) under the scope of \(if\), it will result in the reading (2c), where the presupposition fails to project. Once a presuppositional inference is accommodated, globally or locally, the presupposition is satisfied and this prevents the whole utterance from being meaningless.

(2)  
\begin{enumerate}
  \item (c1) If \((c_2)\) John brings his girlfriend to the party, everyone will be excited.
  \item John has a girlfriend. If John brings his girlfriend to the party, everyone will be excited.
  \item If John has a girlfriend and he brings his girlfriend to the party, everyone will be excited.
\end{enumerate}
2.3 At-issueness

It has long been noticed that presuppositions are backgrounded, i.e. they are contents which are not the main point of the current conversation (Wilson & Sperber 1979, Levinson 1983). It has also been observed that the presuppositions triggered by materials which are marked as given always project, whereas presuppositions triggered by focused materials may fail to project (Hajičová 1984, Beaver and Zeevat 2007). Recently Roberts et al. (2009) and Simons et al. (2010) attempted to give a unified account of projective meaning using the notion of (not-)at-issueness. The observation that embedded presuppositions usually project can be attributed to the fact that the presuppositions are usually not at issue. The basic idea is that the entailment-cancelling operators only target contents which are at issue and only not-at-issue implications can project.

All and only those implications of (embedded) sentences which are not-at-issue relative to the Question Under Discussion in the context have the potential to project. (Simons et al. 2010)

At-issueness can be defined with respect to the Question Under Discussion (QUD), a semantic question which corresponds to the current discourse topic (Roberts 1996). A proposition $p$ is at issue if and only if the speaker intends to address the QUD via the question whether $p$. So it is the speaker’s intention which determines the at-issueness of a proposition. But in order for this intention to be felicitous, the answer of the question whether $p$ must entail contextually a partial or complete answer to the QUD and it must be reasonable for the speaker to expect that the hearer is able to recognize this intention.

According to this theory, the fact that certain presuppositions sometimes fail to project can be explained by that those presuppositions are at issue in their contexts. This can be illustrated by an example taken from Simons et al (2010). The sentence in (3c) can be construed as an answer both to Q1 in (3a) and Q2 in (3b). Depending on which question the speaker of (3c) attempts to address, the presupposition triggered by to know, namely “Harry is dating Sally”, may project or not. If (3c) is meant to be an answer to Q1, then the presupposition is not at issue and hence projects, because it cannot give an answer to Q1. In contrast, if (3c) is considered to be the answer to Q2, the presupposition is clearly at issue and accordingly, it fails to project.

(3) a. Q1: What does Bill think about Harry dating Sally?
   b. Q2: Is Harry dating Sally?
   c. A: Bill doesn’t know that he is.

3. Differences between presupposition triggers

It has been observed that the presuppositions triggered by different triggers show differences in their projection behavior (Karttunen 1971, Stalnaker 1973, 1974, Simons 2001 and Abusch 2002). Factive verbs (e.g. to know, to find out) and iterative adverbs (too, again) are generally recognized as
presupposition triggers (Kiparsky and Kiparsky 1970, Kamp and Rossdeutscher 1994 among others). However, they differ from each other in the tendencies of the presuppositions they trigger to project. For example, we can think of situations in which (4a) can be uttered felicitously, say John has claimed that Sam is in London, but the speaker doubts that John really knows whether Sam is in London. In this case, the speaker doesn’t commit him- or herself to the truth of the presupposition triggered by to know, namely “Sam is in London”, which means that the presupposition fails to project out of the scope of the modal. Otherwise the second sentence in (4a) cannot be felicitously uttered, because it would pose a contradiction to the presupposition of the first sentence. On the contrary, we can hardly come up with a context in which (4b) could be felicitously uttered, which may be attributed to the fact that the presupposition triggered by again in this sentence, i.e. “Sam was in London before” projects very stably and hence makes the second sentence in (4b) inconsistent: once it is taken for granted that Sam was in London before, it is not possible anymore that he has never been to London.

(4) a. Maybe John knows that Sam is in London. But it is also possible that Sam isn’t in London at all.
   b. #Maybe Sam is in London again. But it is also possible that Sam has never been to London before.

While the presuppositions triggered by too and again are said to project uniformly, the presuppositions triggered by factive verbs show an elusive picture. According to Karttunen (1971) factive verbs don’t form a homogeneous class: while the presupposition triggered by some factives, like to regret, show relatively stable projection, the presuppositions triggered by other factives, such as to know, to realize and to find out, don’t. Karttunen calls the latter “semifactives”. This difference can be exemplified by (5a) and (5b), taken from Karttunen (1971). In (5a) the presupposition triggered by to regret, namely that the speaker has not told the truth must project out of the scope of the conditionals. In contrast, the presupposition triggered by to realize or to find out as in (5b) doesn’t have to project.

(5) a. If I regret later that I have not told the truth, I will confess it to everyone.
   b. If I realize/find out later, that I have not told the truth, I will confess it to everyone.

So far, it has only been stated that there is a difference between the presuppositions triggered by different triggers, namely some of them don’t have to project. This suggests more or less a dichotomy of presupposition triggers: the class of triggers which trigger presuppositions that invariably project and the class of triggers which trigger presuppositions that may fail to project. But it is also conceivable that the differences are more fine-grained, namely that every presupposition trigger is associated with a different probability for the presupposition it triggers to project. In this section we want to present some new experimental data concerning the difference in projection behavior of presuppositions triggered by different lexical triggers.

3.1 Methods
In this pilot study, we examined the projection behavior of the presuppositions triggered by four German lexical triggers under conditionals: wissen (‘to know’), erfahren (‘to find out’), auch (‘too’) and wieder (‘again’). 34 German native speakers between the age of 20 and 42 participated in our web-based experiment using WebExp. The subjects were confronted with sentence-question pairs written in German each of which consists of one target conditional sentence and a question task. In each target sentence, one of the four lexical triggers is embedded in the antecedence of the conditional. Each question task aims at rejecting the presupposition triggered by the lexical trigger in the target sentence. Both (6) and (7) are examples of a sentence-question pair containing wissen (‘to know’), and wieder (‘again’) respectively.

(6) a. (Sentence) Wenn Paul weiß, dass Christine gerne Tee trinkt, schenkt er ihr eine Teekanne.  
   ‘If Paul knows that Christine likes tea, he will give her a teapot as a present.’
   b. (Question) Ist es möglich, dass Christine nicht gerne Tee trinkt?  
   ‘Is it possible that Christine doesn't like tea?’

(7) a. (Sentence) Wenn Thomas wieder Sushi macht, hilft Maiko dabei.  
   ‘If Thomas makes Sushi again, Maiko will help him.’
   b. (Question) Ist es möglich, dass Thomas noch nie Sushi gemacht hat?  
   ‘Is it possible that Thomas hasn’t made Sushi before?’

The task of the subjects was to answer the questions on the basis of the information provided in the given conditional sentence. The subjects had choice between three answer options as listed in (8).

(8) a. Ja, das ist möglich.  
   ‘Yes, it’s possible.’
   b. Nein, das ist nicht möglich.  
   ‘No, it’s not possible.’
   c. Ich weiß es nicht.  
   ‘I don’t know.’

A total of 12 critical sentence-question pairs (3 pairs per trigger) and 18 fillers comprised the material and the content of all the target sentences is about comparable daily life situations. The sentence-question pairs were presented in a random order and subjects did the tasks without time pressure.

Since we presented the target sentences to the subjects without a context and the subjects are not real participants in a conversation, we have to make certain assumptions in order to interpret their answers. We assume that the subjects, when confronted with a target sentence, always reconstruct a conversational context with themselves as hearers and an imaginary speaker. A subject will choose the answer (8a) “Yes, it’s possible” if and only if the target presupposition fails to project in the reconstructed context. A subject will answer (8b) “No, it’s not possible”, if and only if the target presupposition projects in the reconstructed context. The consideration is as follows: Whenever a subject answers with “Yes” he or she
thinks that it is possible that the presupposition in the target sentence doesn’t hold. For example, if a subject answers “Yes” to the question in (6b), he or she thinks that it is not necessarily the case, that Christine likes tea. Then we can conclude that the presupposition “Christine likes tea” triggered by wissen (‘to know’) in the target sentence (6a) fails to survive the conditional operator, because the subject obviously doesn’t take it for granted. Therefore we conclude that the presupposition doesn’t project if the answer is “Yes”. In contrast, if a subject answers “No, it’s not possible”, he or she has committed him or herself to the truth of the target presupposition, thus the presupposition has survived the conditional and hence projects.

3.2 Results
As discussed above, we can take the probability of the “No” answers as the probability for projection of a presupposition. We found out that the presupposition triggered by wissen (‘to know’) shows the lowest probability to project (38.24%). The presuppositions triggered by erfahren (‘to find out’) are in between (51.96%) differing significantly both from wissen (‘to know’) (df=2, \( \chi^2=6.83, p<0.05 \)) and the other two (df=1, \( \chi^2=33.9, p<0.005 \)). In contrast, the presuppositions triggered by auch (‘too’) and wieder (‘again’) show very high probability to project: 87.25% and 99.02% respectively. Although there seems to be a difference between again and too, this difference is statistically not significant.

<table>
<thead>
<tr>
<th></th>
<th>wissen</th>
<th>erfahren</th>
<th>auch</th>
<th>wieder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>‘to know’</td>
<td>‘to find out’</td>
<td>‘too’</td>
<td>‘again’</td>
</tr>
<tr>
<td>Yes…</td>
<td>57.35% (39)</td>
<td>48.04% (49)</td>
<td>12.75% (13)</td>
<td>0.98% (1)</td>
</tr>
<tr>
<td>No… (projecting)</td>
<td>38.24% (26)</td>
<td>51.96% (53)</td>
<td>87.25% (89)</td>
<td>99.02% (101)</td>
</tr>
<tr>
<td>uncertain</td>
<td>4.41% (3)</td>
<td>0.00% (0)</td>
<td>0.00% (0)</td>
<td>0.00% (0)</td>
</tr>
</tbody>
</table>

Table 1. Results of experiment I: projection

3.3 Discussion
Our pilot study shows: In lack of a context, the projection behavior of different presuppositions triggered by different lexical items differs to a great extent: While some invariably project, others do not. The presuppositions triggered by auch (‘too’) and wieder (‘again’) come with a much higher probability to project than the presuppositions triggered by the factive verbs wissen (‘to know’) and erfahren (‘to find out’). These findings are in line with the observations by Karttunen (1971), Stalnaker (1974) Simons

*Note that we eliminated one item for to know, for an uncontrolled additional factor: stage vs. individual level predicates. The sentence-question pair: “If Sarah knows that Markus is hungry, she will cook a lot. – Is it possible that Markus isn’t hungry?” shows unusual strong preference for “Yes” answers (33 out of 34). We believe that this is due to the stage level predicate “to be hungry” which doesn’t show up in other sentences. Therefore we left out the answers to make the results more comparable. Leaving these results in the statistics would have made the probability for projection (“No” answer) even lower.
(2001, 2007) and Abusch (2002). But our experiment also shows that the whole picture is more fine-grained: both being factive verbs, wissen (‘to know’) and erfahren (‘to find out’) show different projection probability of their presuppositions as there is a significant difference between them.

4. Relationship between not-projecting presuppositions and at-issueness

In the previous section we first introduced the observations in the literature that the commonly recognized presupposition triggers show differences in the projection behavior of the presuppositions they trigger. Then we have experimentally shown that the presupposition triggered by different triggers project differently. But how can these findings be explained? Both the pragmatic account and the local accommodation account can explain not-projecting presuppositions to some extent. But they fail to make precise predictions about when a presupposition doesn’t project. In contrast, the at-issueness account predicts that a presupposition fails to project if and only if it is at issue. This account would explain the findings of our first experiment in that the presuppositions project if and only if they are at issue in the context that the subject reconstructs. If we assume that the reconstruction of contexts for a certain trigger always follows the same pattern, we may expect that in isolation, the probability for a presupposition to project is correlated with its probability to be at-issue. That means if the at-issueness account is right, we should be able to reproduce the differences in projection behavior of the presuppositions also in an at-issueness test.

In this section we will show experimental data from our pilot study which aims at testing the at-issueness of presuppositions triggered by different triggers and compare them with the data from our first experiment.

4.1 Methods

The susceptibility to direct denial has been regarded as a main property of at-issue inferences (Beaver et al. 2009). At-issue content can be refused directly while not-at-issue content cannot. In order to reject the at-issue content of (9a) we use direct denial with No as in (9b). If we just want to reject the presupposition triggered by his dog, we are reluctant to use No, therefore (9c) is bad. However, we can reject the presuppositional content by means of “fall-back” strategies such as Wait a minute… or Well, but… (von Fintel 2004).

(9) a. A: John fed his dog.
   b. B: No, he didn’t.
   c. B: #No, John doesn’t have a dog.
   c. B: Wait a minute, John doesn’t have a dog. / Well, he did feed a dog, but it wasn’t his dog.

In this experiment we tested the at-issueness of presuppositions triggered by the four triggers which are also tested in experiment I, namely triggers wissen (‘to know’), erfahren (‘to find out’), auch (‘too’) and
wieder (‘again’). 29 German native speakers between the age of 19 and 62 took part in the WebExp experiment. Based on the idea of susceptibility to direct denial, we used a similar design as in Onea and Beaver (2011) to measure at-issuiness in isolation: the subjects were presented with written target sentences embedding one of the four triggers. (10) is an example of a target sentence containing the trigger erfahren (‘to find out’).

(10) Tina hat gerade erfahren, dass Max im Urlaub ist.
‘Tina has just found out that Max is on vacation.’

For each sentence three answer options are given which all aim at the contradiction of the presupposition triggered by the lexical trigger in the given sentence. The three given answers only differ in the beginning: a. Ja, _und_ (‘Yes, and’), b. Ja, _aber_ (‘Yes, but’) and c. Nein (‘No’). The subjects were asked to choose one of the three given answers as a reply to the given utterance. In (11) an example is given for the three answer options to the target sentence in (10).

(11) a. Ja, _und_ Max ist gar nicht im Urlaub.
‘Yes, and Max is not on vacation at all.’

b. Ja, _aber_ Max ist gar nicht im Urlaub.
‘Yes, but Max is not on vacation at all.’

c. Nein, Max ist gar nicht im Urlaub.
‘No, Max is not on vacation at all.’

The critical material consists of 8 target sentences (two lexicalizations per trigger) and three answer options for each target sentence. The sentences were presented in a random order.

It has to be noted that all the target sentences give rise to at least two different inferences. For example the sentence (10) has two implications, namely: a. “Max is on vacation”, and b. “Tina obtained the information that Max is on vacation”. The first implication is presuppositional and the second is the truth-conditional implication proper. All of the three given answers in (11) aim at the negation of the presupposition. We assume that “No” is the only direct way to reject an implication among these three answer options. Both “Yes, but” and “Yes, and” answers are indirect denials, since there is nothing right about the presupposition. Whenever a person answers with “Yes”, he or she is not really denying the presupposition but is affirming the other implication. But we still believe that “Yes, but” answers come with a stronger force of rejection than the “Yes, and” answers. In the light of these considerations, we expect that a subject will choose “No” as answer if and only if the presupposition is conceived as at issue. If the inference is not at issue, he or she will resort to less radical means of contradiction.

* We didn’t use answer options such as _Wait a minute..._ as suggested by von Fintel (2004) for following reasons: 1. What we want to manipulate is the “directness” of the denials, as it is correlated with the at-issueness of an inference. It is less clear why _Wait a minute..._ is an indirect denial. 2. “Yes” answers have a similar length as “No” answers and that may avoid additional factors.
4.2 Results
We could observe that the presuppositions triggered by wissen ('to know') come with a very high probability to be rejected by “No” (72.41%). In 50% of the cases the presuppositions triggered by erfahren ('to find out') are rejected directly. The presuppositions triggered by auch ('too') and wieder ('again') are barely susceptible to direct denial (25.86% and 22.41%). So we can conclude that with respect to the sentences we provided, the presuppositions triggered by wissen ('to know') are more likely to be at issue than those triggered by erfahren ('to find out') (df=2, $\chi^2=7.76$, p<0.05), the presuppositions triggered by erfahren ('to find out') are more likely to be at issue than those triggered by auch ('too') and wieder ('again') (df=2, $\chi^2=9.64$, p<0.01).

<table>
<thead>
<tr>
<th></th>
<th>wissen ‘to know’</th>
<th>erfahren ‘to find out’</th>
<th>auch ‘too’</th>
<th>wieder ‘again’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, and</td>
<td>0.00% (0)</td>
<td>5.7% (3)</td>
<td>18.97% (11)</td>
<td>6.90% (4)</td>
</tr>
<tr>
<td>Yes, but</td>
<td>27.59% (16)</td>
<td>44.83% (26)</td>
<td>55.17% (32)</td>
<td>70.69% (41)</td>
</tr>
<tr>
<td>No (at issue)</td>
<td>72.41% (42)</td>
<td>50.00% (29)</td>
<td>25.86% (15)</td>
<td>22.41% (13)</td>
</tr>
</tbody>
</table>

Table 2. Results of experiment II: at-issueness

4.3 Discussion
Since the sentences we have tested in this experiment are also in isolation, we assume that the subjects have to reconstruct a context to interpret the target sentences. Reconstructing a context involves identifying a communication goal of the participants of the conversation and accommodating assumptions that should be in the Common Ground. Identifying a communication goal will result in identifying a QUD. Once the reconstruction of the context is done, a hearer has already decided whether an implication is at issue since the QUD is set. Thus, the probability of the tested presuppositions to be at issue can be interpreted as the probability of the hearer to reconstruct a context in which the presupposition is at issue. Therefore, the results of this experiment can be interpreted as the probabilities of the reconstruction of an (not-)at-issue context for each of the presuppositions triggered by the lexical triggers. To be more concrete, our experiment shows it is very likely for the presupposition triggered by wissen ('to know') to be at issue in the reconstructed context. On the contrary, the presupposition triggered by wieder ('again') comes with a very low probability to be at issue in the reconstructed context.

4.4 General Discussion
In both experiments, we tested the judgment from a hearer’s perspective, involving reconstructing a Common Ground and reasoning about the goal of the communication. Putting the results of our two pilot studies together, we can observe a clear correlation between projection and not-at-issueness, as shown in
Figure 1 and Figure 2 below, which recapitulate the results presented in Table 1 and Table 2. In Figure 2, the probability for not-at-issue judgments is made up of the probability of “Yes, and…” answers and the probability of “Yes, but…” answers. While presuppositions triggered by wissen (‘to know’) show the lowest probability to project out of a conditional in the first experiment, it is judged mostly as at issue in the second experiment. The presuppositions triggered by auch (‘too’) and wieder (‘again’) which show the highest probability of projection, turn out to be not at issue in the second experiment. In both experiments the results for erfahren (‘to find out’) lie in between. So our findings are in perfect concordance with the theory proposed by Roberts et al. (2009) and Simons et al. (2010). However it is not clear whether the correlation we have found is a causal one.

The at-issuensess account for projection highlights the point that the projection is not a property of an implication in isolation but the property of an implication in a communicational context, since it only makes sense to speak of at-issuensess in a context with a communication goal. In this sense, the presupposition projection is a pragmatic issue. But our experiments suggest that the presuppositions triggered by the triggers seem to be each associated with a certain tendency to be in an at-issue context: the presuppositions triggered by auch (‘too’) and wieder (‘again’) are almost never at issue whereas the presuppositions triggered by wissen (‘to know’) and erfahren (‘to find out’) are often at issue. However, the link between the hard-wired component of the lexical semantics and the ability of occurring in a context as at-issue content, which is clearly conversational, is still missing. The information structure may play a role here. A corpus study conducted by Spenader (2003) shows that people often use factive verbs to introduce hearer-new information. This may explain why the presuppositions triggered by wissen (‘to know’) and erfahren (‘to find out’) are often at issue. But it still needs to be explored what exactly prevents the presuppositions triggered by auch (‘too’) and wieder (‘again’) from being at issue.

It has to be noted that the sentences we tested in the two experiments are very different: while the presupposition triggers in the first experiment were all embedded under conditionals, none of the triggers
in the second experiment were in the scope of an entailment-cancelling operator. However it is not quite clear when an implication of the antecedence of the conditional is at issue, since it still needs to be clarified how to define the Question Under Discussion for the antecedence of a conditional sentence.

5. Conclusion

Our experimental data show the following: First, the presuppositions triggered by different lexical items are associated with different probabilities to project out of conditionals. While the presuppositions triggered by iterative adverbs show a very high probability to project, those triggered by factive verbs are less projective. Second, there is a clear correlation between the not-at-issueness of a presupposition in terms of directness of contradiction and the projection probabilities for presuppositions: The higher the probability for a presupposition of being not at issue, the higher its probability to project. These findings support the claim by Roberts et al. (2009) and Simons et al. (2010) that projection may be explained by not-at-issueness of an implication. Hence we argue that the difference of projection behavior of presuppositions may be attributed to the probability to occur in a not-at-issue context.

Our experiments are a pilot study on the relation between the projection and the at-issueness of projective meaning. In order to gain a deeper insight into this issue, further experimental work is planned to test a wider range of presupposition triggers.

References


