The Proviso Problem: A Note[*]

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Abstract: Several theories of presupposition projection predict that some sentences which intuitively yield unconditional presuppositions should have weaker, conditional ones. For instance, *If John is realistic, he knows that he is incompetent* is predicted to have the presupposition that *if John is realistic, he is incompetent*, whereas one certainly infers that John is in fact incompetent. We summarize some difficulties faced by three solutions, DRT, Singh's 'Formal Alternatives', and Singh's 'Interacting Alternatives'; we then offer a new analysis which is compatible with several semantic theories of projection, and which does not require the addition of a new representational module. In essence, we obtain unconditional inferences by assuming that speakers may ignore certain parts of a sentence when they accommodate a presupposition – presumably to simplify their computational work. They do so by adding to the context an assumption that would satisfy the presupposition of the sentence *no matter which meaning* some of its elements have. Depending on which elements are ignored in this way, a variety of strengthened presuppositions are obtained. We speculate on a possible mechanism (which follows some of Singh's earlier ideas) to determine which of these strengthened inferences are in fact obtained. The analysis correctly predicts some new instances of the Proviso Problem in quantificational examples.

Dynamic semantics (Heim 1983, Beaver 2001) and several other theories (e.g. Schlenker 2008, 2009, George 2008a, b, Fox 2008, Chemla 2008) predict that sentences that intuitively yield unconditional presuppositions should have weaker, conditional ones. This problem has been dubbed by Geurts (1996, 1999) the 'Proviso Problem'. With the convention that we write as $\underline{q}q'$ a clause with a presupposition *q* and an assertive component *q'*, the problematic prediction is that *(p and* $\underline{q}q'$*)* and *(if p,* $\underline{q}q'$*)* presuppose *if p, q* - whereas in many cases they just presuppose *q*. This issue was raised by van der Sandt 1992 and Geurts 1996, 1999 as an argument against Heim 1983 and in favor of their own account of presupposition, DRT ('Discourse Representation Theory'; see also Gazdar 1979 and Karttunen and Peters 1979 for earlier incarnations of the Proviso Problem); the criticism applies in identical form against more recent theories that also predict conditional presuppositions in these cases.

There are two main approaches to the problem. (i) Proponents of DRT (van der Sandt 1992, Geurts 1996, 1999) take these facts to argue in favor of a representational theory of presupposition projection, one in which in many cases presuppositions 'percolate up' to take wide scope – which directly yields unconditional inferences. (ii) Proponents of dynamic accounts (e.g. Heim 1983, Beaver 2001) stick to the semantic analysis of Heim 1983, but supplement it with a strengthening mechanism to explain why unconditional presuppositions are sometimes obtained in lieu of conditional ones. There are two types of strengthening mechanisms. (iia) For some authors, it is purely pragmatic (e.g. Beaver 2001).[1] (iib) For others, it crucially involves a representational component (Singh 2007, 2008, 2009). We will defend a new version of (iib).

Bart Geurts gave an important argument for the view that a representational component must be involved *somewhere* - as is assumed by accounts (i) and (iia). As he notes (Geurts 1996, 1999), it is very difficult for proponents of fully non-representational theories to explain the *contrast* between (1)a, which displays the conditional presupposition predicted by dynamic semantics, and (1)b, which typically yields a stronger (unconditional) inference.

[1] Gazdar 1979, which will not be further discussed here, can be seen as a semantic account which generates unconditional presuppositions

(1) a. Peter knows that if the problem was easy / difficult, someone solved it. (Geurts 1999)
≠> Someone solved the problem.
b. If the problem was easy / difficult, then it isn't John who solved it. (Geurts 1999)
=> Someone solved the problem.

Specifically, the difficulty is to explain why the mechanism of strengthening appropriate for (1)b fails to apply to (1)a. Various solutions can be considered (see for instance Beaver 2001, Heim 2006, Perez Caballo 2007, and van Rooij 2007)[2]; we will not discuss them here. Rather, we will summarize the problems faced by three of the most articulated accounts of the Proviso Problem: DRT, Singh's 'Formal Alternatives' (Singh 2007), and Singh's 'Interacting Alternatives' (Singh 2008, 2009). As announced, we will offer a new solution which is compatible with semantic accounts (such as Heim's satisfaction theory) and involves a strengthening mechanism that has a representational component – albeit one which is obtained by modifying in systematic ways the Logical Form of the target sentence.

We will distinguish between two problems:[3]

(i) *Strengthening Problem:* By which mechanism can conditional presuppositions be strengthened?

(ii) *Selection Problem:* How does one choose among the unstrengthened and strengthened presuppositions?

This note is primarily devoted to the Strengthening Problem. In a nutshell, we obtain unconditional inferences by assuming that subjects typically ignore certain parts of a sentence when they accommodate its presupposition – presumably to simplify their computational work. They do so by adding to the initial context some assumptions that would satisfy the presupposition of the sentence *no matter which meaning* some of its elements have. Depending on which elements are ignored in this way, a variety of strengthened presuppositions are obtained. Following some of Singh's earlier ideas (Singh 2006), we briefly speculate that the choice among the various accommodation possibilities is made by ignoring those elements whose (probabilistic) relevance to the lexical presupposition is weakest. On an empirical level, the analysis correctly predicts some new instances of the Proviso Problem in quantificational examples.

1 Three Recent Theories

1.1 DRT[4]

1.1.1 The analysis

The DRT analysis of presupposition projection (van der Sandt 1992, Geurts 1999) seeks to offer a viable alternative to Heim's dynamic semantics, one that does not suffer from the Proviso Problem. The basic idea is that presuppositions are parts of a Logical Form that want

[2] One solution, explored for instance in Heim 2006, would be to account for the contrast between (1)a and (1)b by appealing to the *scalar implicatures* of these sentences to block certain patterns of accommodation. Since the sentences in (1) have different forms, they will have different scalar alternatives, which might induce very different implicatures (note that on this theory it is ultimately the representational component used to generate implicatures which accounts for the contrast between (1)a and (1)b).

[3] In effect, a similar distinction is made in Singh (2007, 2008, 2009), who offers a solutions to the Strengthening Problem but not to the Selection Problem. Our theory is essentially in the same position (all we contribute to the Selection Problem are some speculations, which follow some of Singh's own ideas).

[4] Some of the problems discussed in this section are analyzed from a different perspective in Schlenker, to appear (there the goal is to offer a synthesis of DRT and of recent theories of local contexts).

to 'percolate up' as far as possible in a Logical Form. Whenever possible, they are given matrix scope, though other – and less preferred – options are also open.

To illustrate, we start from a sentence such as (2)a, which is given the initial representation in (2)b (here too the presupposition is underlined).

(2) a. If John is realistic, he knows that he is incompetent.
b. $[_1$ x: John x, $[_2$: realistic x] ⇒ $[_3$: <u>x is incompetent</u>, x believes that x is incompetent]]

There are various 'projection sites' that the underlined material could land in (accessibility constraints are taken to be given independently by properties of anaphora, which is what DRT was originally designed to handle in Kamp 1981). We obtain three possible readings depending on the landing site: in (3)a the presupposition appears at the matrix level, and we obtain an unconditional inference that John is incompetent – which is the preferred reading; in (3)b, the presupposition lands in the antecedent of the *if*-clause ('intermediate accommodation'), while in (3)c it stays in its original position ('local accommodation'). In this case these readings are not plausible, but they have been claimed to be instantiated in other examples (this is not debated for local accommodation; intermediate accommodation is far more controversial, as is for instance discussed in Beaver 2001[5]).

(3) a. **Reading 1 [preferred]: Global Accommodation**
$[_1$ x: John x, **x is incompetent** $[_2$: realistic x] ⇒ $[_3$: x believes that x is incompetent]]
b. **Reading 2: Intermediate Accommodation**
$[_1$ x: John x $[_2$: realistic x, **x is incompetent**] ⇒ $[_3$: x believes that x is incompetent]]
c. **Reading 3: Local Accommodation**
$[_1$ x: John x $[_2$: realistic x] ⇒ $[_3$: **x is incompetent**, x believes that x is incompetent]]

1.1.2 Problem 1: Conditional Presuppositions

It has been argued that in some cases *bona fide* conditional presuppositions do arise (e.g. Beaver 2001). By '*bona fide* conditional presuppositions' I mean conditional inferences that project like presuppositions (e.g. in questions), and thus cannot be explained away as mere entailments. These examples are significant because DRT cannot account for them; for instance, when embedded under the question operator none of the three readings represented in (3) gives rise to a conditional inference that *if John is realistic, he is incompetent*. In this case this is a good thing, but in other cases this is not so. The examples in (4)a and (5)a arguably do yield precisely the kind of conditional inference that DRT rules out (I say 'arguably' because there are empirical disagreements in the literature on precisely this matter, and experimental data would be needed to settle the issue).

(4) a. If this applicant is 64 years old, does he know that we cannot hire him?
=> If this applicant is 64 years old, we cannot hire him.
≠> We cannot hire this applicant.
b. If this applicant is 64 years old, we cannot hire him
=> If this applicant is 64 years old, we cannot hire him.
c. If this applicant is 64 years old, can we not hire him?
≠> If this applicant is 64 years old, we cannot hire him.

(5) a. If this applicant is 64 years old and realizes that we cannot hire him, he won't be disappointed by a rejection letter.
=> If this applicant is 64 years old, we cannot hire him.
≠> We cannot hire this applicant.

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[5] The issue of intermediate accommodation is further discussed in Schlenker, to appear; dubious cases of intermediate accommodation (into the restrictor of an operator) are contrasted with more robust cases, due to Bart Geurts (they involve intermediate accommodation within the scope of attitude operators).

b. If this applicant is 64 years and we cannot hire him, he won't be disappointed by a rejection letter.
≠> If this applicant is 64 years old, we cannot hire him.

(4)a has the form *if p, qq' ?* with *p = this applicant is 64 years old* and *q = we cannot hire this applicant*. If the conditional did not appear in a question, the inference we obtain (= *If this applicant is 64 years old, we cannot hire him*) could be treated as a mere entailment, as is certainly the case in (4)b. But the fact that the conditional inference survives in a question in (4)a (but not in (4)c) shows that we are dealing with a *bona fide* conditional presupposition. The argument is even more direct for (5)a, which is of the form *if p and qq', r*: a mere entailment of the antecedent of the conditional is not inherited by the entire conditional, as is illustrated in (5)b; on the other hand, the conditional inference we get in (5) is as predicted by Heim 1983: *p and qq'* presupposes *if p, q*, and this presupposition should project out of the antecedent of the conditional, as it indeed does.

I believe that there is another class of cases in which conditional presuppositions are robustly obtained. It involves 'anaphoric triggers', i.e. expressions such as *too* (these are characterized by the fact that they are often felt to be inappropriate unless they have an antecedent in the discourse, as argued by Beaver and Zeevat 2007; and the presupposition they trigger is also almost impossible to accommodate locally). Thus *Peter too will insult you* triggers a presupposition that some salient individual (other than Peter) will insult you; and the sentence is rather infelicitous unless a sentence of the form *x Y* is present in the discourse, where *x* denotes someone other than Peter and *Y* can be taken to entail *insulting you*.[6] With this background in mind, we can consider the examples in (6)-(7), which seem to me to have a clear conditional presupposition.

(6) a. If John visits his parents for Christmas, his sister too will give them hard time.
b. If John visits his parents for Christam, will his sister too give them a hard time?

≠> Someone will give John's parents a hard time.
=> If John visits his parents for Christmas, someone (namely John) will give them a hard time.

(7) a. If John calls you a Republican, his wife too will insult you.[7]
b. If John calls you a Republican, will his wife too insult you?

≠> Someone will insult you.
=> If John calls you a Republican, someone (namely John) will be insulting you.

Inferences triggered by (French) examples of this sort are investigated with experimental means in Chemla and Schlenker 2011a, b. It is shown that French versions of (8) give rise to the conditional inference in (9)b rather than to the unconditional inference in (9)a.

(8) If Ann decides to study abroad, her brother too will make a stupid decision.

(9) a. *Unconditional inference:* Jeanne will make a stupid decision.
b. *Conditional inference:* Studying abroad would be stupid of Jeanne.

If, as is usually assumed, local accommodation is extremely difficult with triggers such as *too*, these results may suggest that *bona fide* conditional presuppositions are indeed obtained in some cases. We come back to anaphoric triggers in Section 4.1, where try to explain why they give rise to particularly robust conditional (rather than unconditional) inferences.

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[6] It is claimed in Chemla and Schlenker 2011a, b that global accommodation may be appealed to in order to ensure that the entailment does go through (relative to the context set).
[7] Modified from Lakoff 1971 (cited in Karttunen 1974), who used (i):

(i) John called Mary a Republican and then she insulted him back

1.1.3 Problem 2: Quantified Statements

❑ *Basic Problems*

Due to the architecture of DRT, a presupposition that contains a bound variable cannot be accommodated outside the scope of its binder, as this would 'unbind' the variable (this is sometimes called the 'trapping constraint'). In simple cases, we can still obtain the correct results through local or intermediate accommodation. For instance, (10)a gives rise to an inference that *each of these ten students is incompetent*, and this inference is captured by the reading with local accommodation in (11)a.

(10) a. Each of these ten students knows that he is incompetent
b. [[each x: student x] **x is incompetent**, x believes that x is incompetent]

(11) a. Local Accommodation
[[each x: student x] **x is incompetent**, x believes that x is incompetent]
b. Intermediate Accommodation
[[each x: student x, **x is incompetent**] x believes that x is incompetent]

As soon as we consider non-assertive uses of (10)a, however, the predictions are far more problematic.

(12) a. Does each of these ten students know that he is incompetent?
a'. [Pointing towards a group of ten male students]
Does each of them know that he is incompempent?
b. If each of these ten students knows that he is incompetent, they must be depressed.
b'. [Pointing towards a group of ten male students]
If each of them knows that he is incompetent, they must be depressed.

In each case we find, as before, an inference that each of these ten students is incompetent. But this is not predicted by either local or intermediate accommodation; in particular, local accommodation fails to make the right predictions because in these cases the Logical Form in (11)a appears in a non-assertive environment.[8]

The problems get worse when the quantifier *no* is considered. Chemla 2009 shows with experimental means that French sentences of the form *[No P] QQ'* yield the universal inference *[Every P] Q* (here capital letters stand for predicative elements). For instance, (13)a triggers an inference that *each of these ten students is incompetent*. Here the problem arises even without embedding the sentence in a more complex environment: it can be checked that neither Logical Form in (14) derives the correct inference.

(13) a. None of these ten students knows that he is incompetent
b. [[no x: student x] **x is incompetent**, x believes that x is incompetent]

(14) a. Local Accommodation
[[no x: student x] **x is incompetent**, x believes that x is incompetent]
b. Intermediate Accommodation
[[no x: student x, **x is incompetent**] x believes that x is incompetent]

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[8] D. Rothschild (p.c.) has suggested that intermediate accommodation (into the restrictor of the demonstrative) might yield the right results for (14)a-b, because (i) arguably gives rise to an inference that *all of these 10 students failed the exam* (this is presumably due to the semantics of *these)*. This line of analysis won't easily extend to (14)a'-b', however.

(i) Do any of these 10 students who failed the exam like living here?

- *Proviso Redux*

Even when DRT predicts appropriate inferences in simple quantified statements, further embeddings can lead to the re-appearance of the Proviso Problem.

(15) If I grade their homeworks, each of my students will know that he is {a genius | incompetent}.
=> Each of my students is {a genius | incompetent}

Due to the 'trapping constraint', the presupposition triggered by *know* must be accommodated within the scope of *each of my students*. As a consequence, it must remain within the consequent of the conditional – and we just cannot obtain an unconditional presupposition in this case.

Of course the situation does not improve in cases in which the predictions for quantified examples were not appropriate to begin with. Thus (16) gives rise to an unconditional presupposition that each of my students is a genius / incompetent, but since the presupposition is trapped within the scope of the quantifier it must also remain within the consequent of the conditional.

(16) If I don't grade their homeworks, none of my students will know that he is {a genius | incompetent}.
=> Each of my students is {a genius | incompetent}

1.1.4 Problem 3: Semi-conditional presuppositions

Geurts 1996 and Singh 2007 argue that in examples such as (17) we obtain a kind of 'semi-conditional' presupposition, of the form: *If John is a scuba diver, he has a wetsuit* - rather than a 'fully conditional' presupposition, of the form *If John is a scuba diver and wants to impress his girlfriend, he has a wetsuit*.

(17) If John is a scuba diver and he wants to impress his girlfriend, he'll bring his wetsuit

In this case the inference is not too surprising, since one generally assumes that scuba divers have wetsuits – and hence the inference might just be due to world knowledge. But other cases can make the same point. For instance, depending on which version of (18) one picks (with *can* vs. *cannot*), one obtains an inference that *if John is 64 years old, he {can | cannot} apply for this job* – and world knowledge certainly can't account for both inferences at once.

(18) If John is 64 years old and he knows our hiring practices, he is aware that he {can | cannot} apply for this job.
≠> John {can | cannot} apply for this job.
=> If John is 64 years old, he {can | cannot} apply for this job.

DRT cannot account for this fact. For a conditional inference to be obtained, the presupposition must stay within the consequent of the conditional. But if so, we get the fully conditional inference that *if John is 64 years old and he knows our hiring practices, he {can | cannot} apply for this job*. This is too weak, since we want the semi-conditional inference that *if John is 64 years old, he {can | cannot} apply for this job*.

Schlenker, to appear discusses a variant of DRT with explicit context variables denoting the 'context sets' that played a crucial role in Heim's analysis (1983). The problem of conditional presuppositions and of simple quantified statements can be solved within this modified framework. However two important problems remain: the re-appearance of the Proviso Problem in quantified statements such as (15), and the problem of semi-conditional presuppositions. Both problems are solved within the framework we develop in Section 3.

2 Singh's Formal Alternatives (Singh 2007)

2.1 Singh's Analysis

Motivated in part by the problem of semi-conditional presuppositions, Singh 2007 offers an articulated solution to the Proviso Problem. The basic idea is that when an assumption *A* is globally accommodated to satisfy the presupposition triggered by an expression *dd*, *A* is constrained to have a form which is determined by *d* together with the syntactic environment in which it occurs. Thus for (17) Singh generates a 'hypothesis space' H of the form H = {*John has a wetsuit, If John is a scuba diver and he wants to impress his girlfriend, he has a wetsuit, If John wants to impress his girlfriend, he has a wetsuit, If John is a scuba diver, he has a wetsuit*}. In this way, Singh solves the Strengthening Problem; some other mechanism is supposed to determine which of these hypotheses is added to the initial context set to ensure that the relevant presupposition is satisfied (this is the 'Selection Problem').

Singh's particular implementation relies on a modification of Heim's dynamic semantics (Heim 1983). Restricting attention to the propositional case, he proposes that the hypothesis space for accommodation of a presuppositional expression *pp'* evaluated in a local context $C[F_1]\ldots[F_n]$ is *p*, together with all the conditional statements of the form *if* $[F_{i_1}$ *and… and* $F_{i_k}]$, *p*, where $k \leq n$ and $i_1, \ldots i_k$ are among $\{1, \ldots, n\}$. Specifically, his proposal has two components.

1. First, Heim's recursive definition of the context update is refined so as to keep track of the *syntactic elements* that played a role in process. Thus Singh provides a recursive definition of the local context *description* (a syntactic object) for a presupposition trigger *pp'* which occurs in a sentence *S* relative to a context set C – something he calls *L(pp', S, C)*. Local context descriptions always have the form $C[X_1]\ldots[X_n]$ (but $X_1\ldots X_n$ maybe be complex and involve further local context descriptions).

2. Singh then defines the *hypothesis space* H for accommodation for a presupposition trigger *pp'* with a local context description $C[F_1]\ldots[F_n]$. It is the set that includes *p*, together with all the conditional statements of the form *if* $[F_{i_1}$ *and… and* $F_{i_k}]$, *p*, for $\{i_1, \ldots, i_k\}$ any subset of $\{1, \ldots, n\}$.

It can be checked that this procedure yields in many cases a hypothesis space that does include the presuppositions that are in fact accommodated.

• As was mentioned at the outset, Singh predicts for (17) a space that includes *If John is a scuba diver, he has a wetsuit* – which is a candidate for accommodation in this case.

• Singh's procedure guarantees that the local context of *G* is the same in *if F, G* and in *F and G*. In both cases, the description of the local context is *C[F][G]* if the global context is C; and the same hypothesis space will be generated in both cases for a trigger in *G*. So for *p and qq'*, we will also obtain the hypothesis space H = {*q; if p, q*} – which seems adequate.

2.2 Problems

There are two main difficulties with Singh's 'Formal Alternatives' theory.

1. On a conceptual level, it introduces powerful new mechanisms to account for the data, which raises questions about its explanatory depth.

-First, Singh's analysis departs from Heim's theory in keeping track of the particular way in which local contexts are computed. In other words, Heim's framework needs to be enriched with a component that is partly syntactic and partly semantic – which makes the resulting framework quite powerful.[9] Another consequence of this property is that it is difficult to adapt Singh's analysis to other theories that compute local contexts in different ways. For instance, a non-dynamic procedure for computing local contexts is developed in Schlenker 2009, 2010; it derives the main results of Heim 1983, but because it obtains local contexts without dynamic updates, it is hard to see how Singh's proposal could be incorporated into it.

-Second, nothing in Singh's theory explains why the hypothesis space has the shape that it does. Even if one grants that one should keep track of the way in which local contexts are computed, it still does not follow that, say, a description *C[p][q]* for the trigger <u>r</u>*r'* should give rise to the space H = {*r; if p and q, r; if p, r; if q, r*}. One could imagine further hypotheses that are stronger than *if p and q, r*, e.g. *if p or q, r*. Why is such a hypothesis not included? Here Singh's theory is in one respect closer to Karttunen 1974 than to Heim 1983: like the former, and unlike the latter, it stipulates in a separate component of the analysis the form of possible presuppositions.

2. On a descriptive level, Singh's analysis is insufficiently general, since it does not say anything about the quantificational case. But it is immediate that the Proviso Problem is just as severe there as it is elsewhere.

(19) a. If I give an exam, each of my students will realize that he is {a genius | incompetent}.
=> Each of my students is {a genius | incompetent}
b. If I don't give an exam, none of my students will realize that he is {a genius | incompetent}.
=> Each of my students is {a genius | incompetent}

(20) a. Each of my students will [realize that he is a genius] if he takes the GRE.
=> Each of my students is a genius.
b. None of my students will [realize that he is incompetent] if he doesn't take the GRE.
=> Each of my students is incompetent.

In (19)a-b, Heim 1983 predicts a conditional presupposition: *if I don't give an exam, each of my students is a genius / is incompetent*. But intuitively a stronger, unconditional inference is obtained. In this case, a rather trivial addition to Singh's system could handle the data, since once one has the presupposition of the quantified clause, it interacts with the conditional in the same way as Singh's propositional presuppositions. But things are a bit more complex in (20)a-b because there the conditional is in the scope of a quantifier, and the accommodated presupposition does not have one of the forms that are predicted in Singh's system.

How one could extend Singh's analysis is fairly clear: for (20)b one would have to generate a hypothesis space of the form {*Each of my students is incompetent; Each of my students is incompetent if he doesn't take the GRE*}. But here too, we have to stipulate in the definition of the hypothesis space that potential presuppositions have a universal form – something that Heim's dynamic semantics was supposed to handle at the same time as it did truth conditions.[10]

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[9] Singh acknowledges that the addition of a new level of representation – his context change potential descriptions – is a significant departure from Heim's theory (fn. 20). But he adds that his proposal 'constitutes a somewhat conservative extension of the theory, once we take seriously the notion of CCPs as specifying "instructions" for context change'.

[10] A further difficulty with this type of solution will arise within theories that predict different presuppositions for different quantifiers – as seems to be necessary on empirical grounds given the experimental results reported in Chemla 2009. For instance, the theories of George 2008a, b, Fox 2008 and Chemla 2008 predict weak

2.3 Singh's Interacting Alternatives (Singh 2008, 2009)[11]

In a later development, Singh (2008, 2009) proposed a different theory of the Proviso Problem, which has some features in common with the present approach. Specifically, Singh keeps from his earlier theory the idea that hypotheses for accommodation must belong to a set which is determined by the shape of the target sentence. But instead of taking the hypothesis space to be derivative on the update procedure (as in Singh 2007), he takes it to be given by *the set of presuppositions of the scalar alternatives of the target sentence*, as is initially defined in (21).

(21) Initial Set of Potential Accommodations
For a sentence φ, the set of potential accommodations is $H = \{\pi(\psi): \psi \in A(\varphi)\}$, where $A(\varphi)$ is the set of scalar alternatives of φ, and $\pi(\psi)$ is the projected presupposition of sentence ψ.

To illustrate, consider (22)a, which has the form *if p, $\underline{q}$q'*. Singh's procedure for generating scalar alternatives (which we do not discuss here) yields (22)b, from which we derive the potential accommodations in (22)c; they seem adequate.

(22) a. If John flies to Toronto, his sister will pick him up from the airport = *if p, $\underline{q}$q'*
b. *Scalar alternatives:* A(a) = {if p, $\underline{q}$q'; p; not p; $\underline{q}$q'; not $\underline{q}$q'}
c. *Initial set of potential accommodations:* H(a) = {if p, q; q}

Singh argues that the initial set of potential accommodations can be further constrained. To see how he does so, it will be useful to define the initial set of potential implicatures of a sentence, as in (23).

(23) Initial set of potential implicatures
For a sentence φ, the set of potential implicatures is $N = \{\neg\psi: \psi \in A(\varphi)\}$

Now Singh makes two main claims. (i) First, the potential accommodations are computed on the basis of the *union* of H and N, i.e. of the initial set of potential implicatures and accommodations defined in (23) and (21)a. (ii) Second, the precise procedure borrows a mechanism from Fox's theory of scalar implicatures (Fox 2007): (a) one should extract from $H \cup N$ the subsets that are maximally consistent relative to the asserted sentence φ and its technical presupposition $\pi(\varphi)$; (b) one should then take the intersection I of these sets; (c) the final set of potential accommodations is $I \cap H$, i.e. just those potential accommodations that are in I.

(24) Final Set of Potential Accommodations
a. Let I be the intersection of all subsets of $H \cup N$ which are maximally consistent relative to the asserted sentence φ and its presupposition $\pi(\varphi)$.
b. The final set H* of potential accommodations for φ is given by: $H^* = I \cap H$.

Singh shows in detail that this procedure delivers good results in the propositional case, and in particular that it adequately predicts Geurts's contrast between *if p, $\underline{q}$q'* (possible accommodation of *p*), and *x knows that if p, q* (no possible accommodation of *p*).

Still, this approach encounters two main problems.

1. On a conceptual level, it is not clear why one should accommodate the presuppositions of (unasserted) scalar alternatives to the sentence under discussion; and it is a bit surprising that

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presuppositions for existential statements but stronger presuppositions for some other quantifiers. The hypothesis space would have to be refined quite a bit to account for such data.

[11] Many thanks to a referee for suggesting that we compare our approach to Singh 2008, 2009. I am particularly grateful to Raj Singh for discussion; this section is a direct reflection of his suggestions.

the procedure should lump potential implicatures and potential presuppositions in the way that it does.

2. On an empirical level, there are two problems, which were both pointed out to me by Raj Singh.
(i) Consider first (25), which has the form *if p*, F_x *q*, where F_x is a factive attitude operator.

(25) If John is realistic, he will regret applying. (= *if p*, F_x *q*, where F_x is a factive attitude operator)

Sentences such as (25) can naturally give rise to a presupposition that *p* – in this case, a presupposition that John applied. But Singh's procedure generates, among others, *q* and *not q* as alternatives. Each of them is consistent with the target sentence *if p*, F_x *q*, and also with its technical presupposition, namely *if p, q*. In fact, *q* and *not q* each belong to a different maximal consistent subset of N ∪ H, and hence neither of them can belong to the intersection of all such sets – which entails in particular that *q* is *not* a candidate for accommodation, contrary to what we want.

(ii) Second, Singh observes that his procedure predicts for *if (p and q)*, $\underline{r}r'$ a potential accommodation *if (p or q), r*. Briefly, it is clear that *if (p or q), r* is in H, since it is the technical presupposition of *if (p or q)*, $\underline{r}r'$, which on standard accounts is a scalar alternative of the target sentence. Second, it can be checked that *if (p or q), r* belongs to each subset of N ∪ H which is maximally consistent relative to the target sentence *if (p and q)*, $\underline{r}r'$ and its technical presupposition *if (p and q), r*.[12] Thus *if (p or q), r* should be a possible accommodation for *if (p and q)*, $\underline{r}r'$ – but there is no empirical argument for this prediction.

We will now set out to develop an analysis which, like Singh's Interacting Alternatives, produces potential accommodations for a sentence *F* by computing the presuppositions of some modifications of *F*. But we consider a very different set of modifications: instead of using scalar alternatives to *F*, we consider sentences that are obtained from *F* by 'ignoring' some of its subcomponents, in a sense to be made precise shortly.

3 Towards A New Analysis: Active Ignorance

Our account has three main properties.

(i) Like DRT and Singh's two theories, it crucially takes into account the *syntactic form* of the sentence as it computes presupposition accommodation. This is an important concession to representational theories of presupposition projection.

(ii) Still, the analysis does not add any representational module of its own. Rather, it just manipulates the (syntactic) input to a semantic mechanism of presupposition projection (there

[12] In Singh's procedure, a sentence *if F, G* has as alternatives {F; not F; G; not G; if F, G}. For *F = (p and q)*, we must also consider the alternatives to the conjunction – in this case *p*, *q*, *(p or q)*, *(p and q)*. *Modulo* logical equivalence, we obtain in Singh's system:
N = {(p and q); not (p and q); (p or q); not (p or q); p; not p; q; not q; $\underline{r}$r'; not $\underline{r}$r'; not [if (p and q), $\underline{r}$r']; not [if p, $\underline{r}$r']; not [if q, $\underline{r}$r']; not [if (p or q), $\underline{r}$r']}
H = {if (p and q), r; r; if p, r; if q, r; if (p or q), r}.
It can be checked that *if (p or q), r* belongs to every subset of H ∪ N which is maximally consistent relative to {if (p and q), r; if (p and q), $\underline{r}$r'} – in fact, *if (p or q), r* is consistent with each member of H ∪ N.

are several such mechanisms on the market[13]). In other words, unlike DRT our analysis does not depend on a representational theory of presupposition projection; and unlike Singh's Formal Alternatives (but like Singh's Interacting Alternatives), it does not rely on a new representational module to a semantic theory.

(iii) Like Singh 2007, 2008, 2009, our theory primarily offers a solution to the Strengthening Problem: it defines a space of *potential* hypotheses for accommodation for each sentence containing a presupposition trigger. We will only have speculations to offer about the Selection Problem in Section 3.2 (following some of Singh's earlier ideas, sketched in Singh 2006).

3.1 The Strengthening Problem

3.1.1 Basic idea

Our basic suggestion is that a subject who tries to accommodate a presupposition (globally) will try to simplify his task by ignoring all material that is not clearly relevant to the presupposition. What does 'ignoring' mean in this case? In a nutshell, the subject will compute a presupposition which is 'good enough' *no matter what the meaning of this material* turns out to be. To put it differently, he will accommodate a presupposition that is guaranteed to make the sentence felicitous even if he has not taken into account the precise meaning of the material in question.

This is best illustrated with a schematic example. Suppose the sentence under consideration has the form *p and* $\underline{q}$*q'*. If *p* is relevant to *q*, the subject will accommodate the 'official' presupposition, namely *if p, q*. But if *p* is not relevant to *q*, he will disregard it by finding a restriction C^+ of the context C which guarantees that, *for any non-presuppositional clauses p'*, the presupposition of *p' and* $\underline{q}$*q'* is (globally) satisfied within C^+:

(26) Computing the presupposition of *p and* $\underline{q}$*q'* while ignoring *p* in a context set C

Find the most conservative restriction C^+ of C which guarantees that *for all p'*, the presupposition of *p' and* $\underline{q}$*q'* is satisfied in C^+, i.e. C^+ |= if p', q.[14]

(Note that we should only consider *non-presuppositional alternatives* to *p*, for otherwise we would impose impossibly strong conditions on C^+.)

The condition in (26) immediately gives rise to the desired conclusion, namely that C^+ should entail *q*. The reasoning is in two steps:

• First, if C^+ |= q, it is clear that for any *p'* the presupposition of *p and* $\underline{q}$*q'* will be satisfied in C^+.

• Conversely, if for all *p'* the presupposition of *p' and* $\underline{q}$*q'* is satisfied in C^+, this should in particular be the case when *p'* is a tautology – and in that case it must be that C^+ |= q.

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[13] Specifically, our proposal can be 'plugged' into: Heim's dynamic semantics; the Transparency theory (Schlenker 2008); the reconstruction of local contexts developed in Schlenker 2009, 2010; Peters's, Beaver and Krahmer's, George's and Fox's trivalent theories (Peters 1979, Beaver and Krahmer 2001, George 2008a, b; Fox 2008); and Chemla's Similarity theory (Chemla 2008)). Note that in the quantificational case, we only discuss in the main text the predictions made by theories that predict universal presuppositions in all cases (Heim 1983, and *modulo* some technical assumptions Schlenker 2008, 2009). Different predictions would be made if the present account were plugged into other theories (e.g. the various trivalent theories, or Chemla's Similarity theory).

[14] *C^+ |= if p', q* means that each world in C^+ satisfies the sentence *if p', q*.

While this analysis can be added on top of every semantic account of presupposition projection, it meshes particularly well with recent theories that account for linear asymmetries in projection by requiring that a presupposition be satisfied *no matter how the sentence ends*. The theories developed in Schlenker 2008, 2009, Chemla 2008, and Fox 2008 (and in a different form Rothschild 2008a) all make use of such a mechanism. To take a very simple example, they explain why $\underline{q}q'$ *and p* has a stronger presupposition than *p and* $\underline{q}q'$ in the following way:

• a certain logical condition – which varies from theory to theory – must be satisfied by both sentences (and by itself this condition would predict the same results in the two cases, since these sentences are logically equivalent);

• but the condition must be guaranteed to be satisfied *as soon as one has processed the presupposition trigger,* without taking into account the end of the sentence. This yields different results in the two cases. For a sentence starting with $\underline{q}q'$ … , there is always the possibility that its final form will be $\underline{q}q'$ *and T,* where *T* is a tautology. As a result, the condition imposed on the initial context set is as strong for $\underline{q}q'$ *and p* as it is for $\underline{q}q'$ *and T* – which is itself equivalent to $\underline{q}q'$; this is why we obtain in the end a presupposition that *q*. By contrast, in *p and* $\underline{q}q'$ the beginning of the sentence can be 'used' to guarantee that the condition is satisfied – which yields a weaker presupposition; for the theories under consideration, this presupposition is in the end that *if p, q*.

In effect, the present proposal selectively extends to the *beginning* of the sentence the technique used by these theories to ensure that a certain condition holds *no matter how the sentence ends*: we require that a presupposition be satisfied when multiple replacements that affect the beginning are considered.[15]

3.1.2 Definitions

To capture the idea that the particular meaning of an expression *E* is ignored, we will require that the accommodated context set satisfy the presupposition under consideration when *E* is replaced with any number of relevant alternatives. In this discussion, we restrict attention to expressions *E* whose type 'ends in t'.

First, we need to develop a theory of alternatives. The simplest option is to consider *all* non-presuppositional expressions of the same type as *E* (for simplicity, we will assume in such cases that all non-presuppositional meanings are expressible). For many applications, it will be enough to consider a set of alternatives that just contains *E* itself, a tautology *T*, and a contradiction *F* - so that Alt(E) = {E, T, F}. In all cases, it is essential that Alt(E) should contain *E* itself: this is what guarantees that ignoring the expression *E* will lead to a presupposition that is never weaker than if *E* were taken into account (since the accommodated context set C^+ will have to satisfy the presupposition of the original sentence, and *in addition* the presuppositions of some alternatives).

Second, we need to determine which alternatives are 'relevant' to a presupposition *d* corresponding to a sentence of the form *a* $\underline{d}d'$ *b* relative to the context set C. For the moment, we will just stipulate what counts as relevant (we speculate on a more principled account in Section 3.2).

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[15] This implementation is very close to Fox's particular analysis of the left-right bias in presupposition projection (Fox 2008). Whereas other accounts quantify over *strings* that turn a partial sentence into a full sentence (so-called 'good finals', as in Schlenker 2008, 2009), Fox suggested that one should keep the syntactic structure constant while performing replacements at various nodes that appear to the right of the presupposition trigger. In effect, the present analysis selectively extends this technique to elements that come *before* the presupposition trigger.

Third, we define the 'skeletal alternatives' of a sentence $a\ \underline{d}d'\ b$ for the trigger $\underline{d}d'$ relative to the context set C. The context set will be accommodated to satisfy the presuppositions of all of these skeletal alternatives. As the following definition makes clear, we obtain the skeletal alternatives of a sentence *S* by performing all possible replacements of irrelevant lexical expressions of *S* with their alternatives. Importantly, replacements are limited to material that lies *outside* of the trigger $\underline{d}d'$ (and could for this reason serve to satisfy the presupposition *d*).

(27) Skeletal alternatives
Let a sentence *S* of the form $a\ \underline{d}d'\ b$ be uttered in a context set C, where $\underline{d}d'$ is a minimal propositional or predicative constituent containing a given trigger.[16] Then the skeletal alternatives of *S* with respect to the trigger $\underline{d}d'$ are defined by:
$Alt_C(a\_b;\ \underline{d}d')$[17] = {$a'\ \underline{d}d'\ b'$: a' and b' are obtained from *a* and *b* by replacing any number of propositional or predicative expressions that are irrelevant to *d* given C with their lexical alternatives}.[18]

To illustrate, suppose that *p* is irrelevant to *q* in the sentence *if p, $\underline{q}q'$* uttered in the context C. By (27), $Alt_C(\text{if p, \_ ; } \underline{q}q') = \{\text{if p}', \underline{q}q' : p' \in Alt(p)\}$. The final result will depend on Alt(p):
1. If Alt(p) = {p, T, F}, then $Alt_C(\text{if p, \_ ; } \underline{q}q') = \{\text{if p}, \underline{q}q'; \text{if T}, \underline{q}q'; \text{if F}, \underline{q}q'\}$.
2. If Alt(p) includes all propositional expressions, we will have $Alt_C(\text{if p, \_ ; } \underline{q}q') = \{\text{if p}', \underline{q}q'$: p' is any propositional expression}.

With these definitions in mind, we can give a first approximation of our procedure of presupposition accommodation. The definition must take care of the general case, in which several presupposition triggers may simultaneously occur in the same sentence; thus the rules we have applied so far will be required to hold *for all triggers* $\underline{d}d'$ which may be found in a sentence *S* (still, this is only a first approximation- a provision must be added in case the sentence contains several presupposition triggers; we come back to this point in Section 4.3.3).

(28) Presupposition Accommodation (first version)
If a sentence *S* is uttered in a context set C and if *d* requires global accommodation with respect to C, the accommodated context set C^+ is the most conservative restriction of C such that:

for all strings *a*, *b* and all presupposition triggers $\underline{d}d'$ such that $S = a\ \underline{d}d'\ b$, for all $S' \in Alt_C(a\_b;\ \underline{d}d')$, C^+ satisfies the presuppositions of *S'*.

3.1.3 Examples

We immediately turn to some examples. For simplicity, we assume throughout the dynamic analysis of Heim 1983 (or the equivalent results of Schlenker 2009), but it should be borne in mind that various other semantic theories could be used as well (for disjunction, which is not discussed by Heim, we borrow the asymmetric dynamic lexical entry of Beaver 2001). For the moment, we just stipulate which expressions count as 'relevant' to a presupposition, and revisit this issue in Section 3.2.

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[16] By 'a minimal predicative or propositional constituent containing a given trigger', we mean a constituent *E* such that for some lexical presupposition trigger *T*, (i) *T* is a sub-expression of *E*; (ii) *E* is of propositional or predicative type; and (iii) no sub-constituent of *E* satisfies (i) and (ii).
[17] We write $Alt_C(a\_b;\ \underline{d}d')$ to make it clear that we are considering the alternatives that must be considered to compute the presupposition of $\underline{d}d'$ in the environment *a_b*. Note that *a* and *b* are strings that might contain other presupposition triggers – which in turn might require that we consider still other alternatives. We come back to this point in Section 4.3.3.
[18] In simple cases, standard theories of presupposition guarantee that the string *b*, which comes after $\underline{d}d'$, plays no role in the computation of presuppositions. But we still allow for the case in which things might be different by considering alternatives to *b*; this will play no role in the present discussion.

Presuppositions are, as before, underlined; and p, p_1, p_2 etc are non-presuppositional clauses. We assume for the moment that for any expression E, Alt(E) is the set of all expressions of the same semantic type (and we also assume that all the meanings of that type are expressible in the language).

We already discussed our first example when we introduced our theory:

Example 1: If p is irrelevant to q in *p and* $\underline{q}q'$ given C, then $C^+ \models q$.

A similar reasoning can be applied to obtain identical results for conditionals, as long as these are treated as material implications as in Heim 1983 (we come back below to a more realistic semantics).

Example 2: If p is irrelevant to q in *if p,* $\underline{q}q'$ given C, then $C^+ \models q$.

It is immediate that the skeletal alternatives to *if p,* $\underline{q}q'$ are all sentences of the form *if p',* $\underline{q}q'$ for any propositional expression p'. As was the case in our informal example, we argue in two steps.

• If $C^+ \models q$, then it is clear that for any p', the presupposition of *if p',* $\underline{q}q'$ is satisfied in C^+ (here it is crucial that we treat conditionals as material implications).

• Conversely, if for any p', the presupposition of *if p',* $\underline{q}q'$ is satisfied in C^+, this is the case in particular if p' is a tautology. In such a case, Heim's dynamic semantics requires that $C^+ \models$ q.[19]

Example 3: If p is irrelevant to q in *John knows that if p, q* given C, then $C^+ \models$ if p, q. In other words, the irrelevance of p does not affect the nature of the presupposition which is accommodated.

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[19] A simple extension of the theory will also yield an account of the examples in (20). Let us focus on (20)b, repeated as (i):

(i) None of my students will [realize that he is incompetent] if he doesn't take the GRE.

We add variables to the object language, so that (i) receives the simplified LF in (ii):

(ii) [No x: Sx] (if not Gx, $\underline{R}$R'x)

On the assumption that G is irrelevant to R, our analysis predicts that

(iii) for every non-presuppositional predicate G', the context set C^+ should satisfy the presupposition of *[No x: Sx] (if not G'x,* $\underline{R}$*R'x).*

Assuming that conditionals are interpreted as a material implications, (iii) will (within Heim's theory) yield the presupposition in (iv):

(iv) [Every x: Sx] Rx

• Clearly, if (iv) is satisfied, so is (iii).

• Now if (iii) is satisfied, it holds in particular when G' is a contradiction, so that *not G'(x)* ends up being tautological. This yields a requirement that the presupposition of [No x: Sx] ($\underline{R}$R'x) be satisified – hence the universal inference in (iv) (because of Heim's rule for presupposition projection in quantified structures; similar results are obtained in Schlenker 2008, 2009).

Within our simplified formalism, we must analyze *John knows that if p, q* as *John* $\underline{P}$*P'*, where $\underline{P}$*P'* is a complex presupposition trigger with P = *if p, q*; and P' = *John believes that P*: the entire Verb Phrase is a minimal constituent of propositional or predicative type which contains a given trigger, namely the verb *know*.[20] The procedure outlined in (27) does not allow us to 'ignore' any part of the trigger itself – or to put it more precisely, any part of the minimal appropriate constituent that contains the trigger (here: the entire Verb Phrase). Furthermore, since *John* is neither a propositional nor a predicative expression, it also cannot be 'quantified out' by the process by which skeletal alternatives are formed (by (27)). Thus must just accommodate the 'official' presupposition, namely *if p, q*.

At this point, we have only derived the simplest results of a DRT-based analysis. But it is also possible to give an account of the Geurts/Singh examples that posed a problem for DRT.

<u>Example 4:</u> If p_1 is irrelevant to q while p_2 is relevant to q in *if* p_1 *and* p_2, $\underline{q}q'$ given C, then $C^+ \models$ if p_2, q.

• If $C^+ \models$ if p_2, q, it is clear that for any p_1', C^+ will satisfy the presupposition of *if* p_1' *and* p_2, $\underline{q}q'$ (in the framework of Heim 1983, the requirement is that $C[p_1'][p_2]$ should entail q, which is clearly the case for any p_1' since $C[p_2]$ entails q).
• Conversely, if for any p_1', C^+ satisfies the presupposition of *if* p_1' *and* p_2, $\underline{q}q'$, this should in particular be the case when p_1' is a tautology – which again leads to the conclusion that $C^+ \models$ if p_2, q.

Finally, we note that the present analysis avoids the re-appearance of the Proviso Problem in quantified statements. As before, we write predicative elements in capital letters (still underlining the presuppositional ones), though in a more sophisticated system variables would have to be added to the object language.

<u>Example 5:</u> If p is irrelevant to Q in *if p, [every Q]* $\underline{R}R'$ and *if p, [no Q]* $\underline{R}R'$ given C, then $C^+ \models$ [every Q] R.

• If $C^+ \models$ [every Q] R, it is clear that the presuppositions of *if p, [every Q]* $\underline{R}R'$ and *if p, [no Q]* $\underline{R}R'$ are satisfied in C.
• Conversely, if for every p' the presupposition of *if p', [every Q]* $\underline{R}R'$ is satisfied in C^+, this holds in particular when p' is a tautology, hence the result.

In the preceding examples, we would have obtained the same result if the rule of active ignorance just replaced a given element with a tautology. But in other cases this is not so. Let us follow Beaver 2001 in adding to Heim's system a dynamic disjunction defined by (29):

(29) C[F or G] = # iff C[F] = # or C[not F][G] = #. If C[F or G] ≠ #, C[F or G] = C[F] ∪ C[not F][G]

With such a disjunction, the predicted presupposition for *p or* $\underline{q}q'$ is *if not p, q*. In case p is irrelevant to q, we can obtain an unconditional presupposition, but we must appeal to an alternative of p which is a contradiction rather than a tautology, as shown in Example 6.

---

[20] More precisely, we can check that *knows that if p, q* satisfies all three conditions of fn.16: (i') it contains the lexical trigger *know*; (ii') it is of propositional or predicative type; (iii') no sub-constituent of *knows that if p, q* satisfies (i') and (ii').

<u>Example 6:</u> If p is irrelevant to q in p *or* $\underline{q}q'$ given C, then $C^+ \models q$

• It is immediate that if $C^+ \models q$, then for any p' the presupposition of p' *or* $\underline{q}q'$ will be satisfied given C^+.
• Conversely, consider the case in which p' is a contradiction. The rule in (29) requires that C[not p'] should entail q, and since *not* p' is a tautology we obtain the result that C should entail q.

3.2 The Selection Problem

At this point we have offered an alternative to Singh's derivation of a hypothesis space: different decisions on which elements count as 'relevant' will yield different strengthened presuppositions. To choose among them, we need an analysis of what 'relevant' means. Without developing a full-fledged theory, here we will follow some of Singh's earlier ideas (Singh 2006) and speculate on a possible rule of thumb. For simplicity, we restrict attention to the case of propositional expressions that contain at most one individual argument; and we write $\pi_C(A / B)$ for the conditional probability of A knowing B given the information in C (it is convenient in this case to adopt a system with variables, so that all presupposition triggers are propositional when their arguments are taken into account). The basic intuition is that $p(x)$ is irrelevant to $q(x)$ just in case one generally does not drastically revise the probability that an arbitrary individual satisfy q when one learns that he satisfies p:

(30) Irrelevance (special case)[21]
Let $p(.)$ be a (non-presuppositional) propositional expression with (at most) one individual argument, and let $\underline{q}q'(.)$ be a propositional presupposition trigger with (at most) one individual argument.
p is irrelevant to q just in case for all individuals d within a contextual domain D, π(d satisfies $q(.)$ / d satisfies $p(.)$) is not very different from π(d satisfies $q(.)$).

We are not ready to give a full specification of the contextual domain D (one might for instance want to restrict attention to individuals that are in some sense 'normal'). But we can still provide one example. Consider (18), repeated below as (31):

(31) If John is 64 years old and he knows our hiring practices, he is aware that he cannot apply for this job.

This example is of the form *if* $p_1(John)$ *and* $p_2(John)$, $\underline{q}q'(John)$, with:
$p_1(x) = x$ *is 64 years old*
$p_2(x) = x$ *knows our hiring practices*
$q(x) = x$ *cannot apply for this job*

We ask whether, for all individuals d in the domain D, π_C(d satisfies $q(.)$ / d satisfies $p_1(.)$) is very different from π_C(d satisfies $q(.)$) – and similarly for π(d satisfies $q(.)$ / d satisfies $p_2(.)$). In other words, do we significantly revise our assessments of the chances that d cannot apply for the job when we learn that (i) d is 64 years old (p_1), or that (ii) d knows our hiring practices (p_2)? In standard cases, the answer would be positive in the case of (i) and negative

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[21] Several extensions would be needed to have the beginning of a general theory.
1. First, the definition of 'irrelevance' should be generalized to predicates of any arity.
2. Second, we might want to define what it means for an expression p to be irrelevant to q *when p and q are of different types*. In case p requires more arguments than q, one could take the existential closure of p,

(i) Let p and q be two expressions such that $p(., ..., .)(.)$ with m arguments is of the same type as $q(.)$. Then p is irrelevant (in an extended sense) to q just in case $\exists x_1 ... \exists x_m\, p(x_1, ..., x_m)(.)$ is irrelevant to $q(.)$.

in the case of (ii). According to this test, then, p_1 is relevant to q while p_2 is irrelevant. Our mechanism of active ignorance can then kick in to predict a semi-conditional presupposition, namely that *if John is 64 years old, he cannot apply for this job* (using the methods of Example 3).

4 Further Predictions and Refinements

4.1 Anaphoric Triggers

We noted at the outset (in Section 1.1.2) that anaphoric triggers such as *too* give rise to clear conditional presuppositions – a conclusion for which there is now some experimental evidence in French (Chemla and Schlenker 2011a, b).

(32) a. If John calls you a Republican, his wife too will insult you.
b. If John calls you a Republican, will his wife too insult you?

≠> Someone will insult you.
=> If John calls you a Republican, someone (namely John) will be insulting you.

We can account for these facts by postulating that *the antecedent of an anaphoric trigger can never be ignored*. In other words, we postulate:
(i) that anaphoric triggers differ from other presupposition triggers in being syntactically indexed with their antecedents;
(ii) that in such cases the antecedent is automatically taken into account (hence not ignored) in the computation of the presupposition that must be accommodated.[22]

This analysis predicts that it should be easy to get 'semi-conditional presuppositions' with anaphoric triggers. I believe this is sometimes the case, as shown in (33):

(33) a. If you have dinner at John's house and he calls you a Republican, his wife too will insult you.
b. If you have dinner at John's house and he calls you a Republican, will his wife too insult you?

A fully conditional presupposition would give rise to the inference that *if you have dinner at John's house and he calls you a Republican, someone (presumably John) will be insulting you*. But we probably derive a stronger inference, namely that *if John calls you a Republican, someone (presumably John) will be insulting you*. This is as predicted by the present analysis if *you have dinner at John's house* is taken to be irrelevant to the proposition *someone* (presumably John) *is insulting you*.

4.2 Quantificational Proviso Problem

The present account predicts that the Proviso Problem should arise in purely quantificational examples as well. Consider (34)-(35) (related examples are found in Charlow (2009)):

(34) a. Among these ten students, everyone who takes my test will realize that he is incompetent.
=> Each of these ten students is incompetent
b. Among these ten students, no one who takes your test will realize that he is incompetent.
=> Each of these ten students is incompetent

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[22] In Chemla and Schlenker 2011a, b, a stronger condition is proposed: the clause that contains the antecedent should play a role in satisfying in satisfying the presupposition it triggers. Specifically, the presupposition obtained with this antecedent is taken into account should be weaker that the presupposition that would be obtained in its absence. This condition would in effect *force* the antecedent to be taken into account.

(35) a. Among my ten best friends, everyone who is smart has stopped smoking.
=> Each my ten best friends used to smoke.
b. Among my ten best friends, nobody who is smart has continued to smoke.
=> Each of my ten best friends used to smoke.

Heim's system predicts presuppositions that are too weak – e.g. in both examples of (34) it predicts that *each of these ten students* <u>*who takes my/your test*</u> *is incompetent*. DRT doesn't fare any better; it fails to get universal presuppositions in (34)b, but even in (34)a it can only get either *each of these students who takes my test and is incompetent will realize that he is* (intermediate accommodation) or *each of these students who takes my test is incompetent and will realize that he is* (local accommodation); neither result is appropriate.

On the assumption that *x takes your test* is irrelevant to *x is incompetent*, we predict in both cases a presupposition that *each of these ten students is incompetent*. Let us see why. These examples have the simplified form in (36) (where we dispense again with the representation of variables).

(36) a. [Each P who R] <u>Q</u>Q'
b. [No P who R] <u>Q</u>Q'

Here we have:
P = student
R = takes your test
Q = being incompetent
Q' = coming to think that one is incompetent

We assume that the head noun is relevant, while the relative clause is, in this particular case, irrelevant to the presupposition *Q* (this is as is suggested by our probabilistic test; in general, π_C(x is incompetent / x took your test) is presumably not very different from π_C(x is incompetent): the mere information that x took a test is not ground enough to drastically revise the probability that x is incompetent).

• It is immediate in Heim's system (and in many others) that for any *R'*, the presuppositions of *[Each P who R']* <u>*Q*</u>*Q'* and *[No P who R']* <u>*Q*</u>*Q'* will be satisfied in each context C^+ that satisfies $C^+ \models$ [Each P] Q.
• Conversely, if for any *R'*, C^+ satisfies the presuppositions of *[Each P who R']* <u>*Q*</u>*Q'* and *[No P who R']* <u>*Q*</u>*Q'*, this is in particular the case when *R'* is a tautology – and in both cases we end up with a requirement that $C^+ \models$ [Each P] Q.[23]

[23] Charlow 2009 discussed related examples:

(i) Two of the history majors in that group also smoke Marlboros_F.

As he observed, "what this seems to presuppose isn't that every history major smokes something besides Marlboros", but rather that "every individual in the domain previously discussed—viz. the students—smokes Marlboros" (as Charlow (p.c.) observes, narrow focus on the restrictor brings out such readings). One way to account for this observation is to take *history* to be irrelevant to the presupposition triggered in the VP. If so, we derive an inference that for all alternatives *X* to *history*, the presupposition of the sentence *Two of the X majors in that group also smoke Marlboros* is satisfied.

4.3 Necessary Refinements

4.3.1 Cases where the accommodated presupposition might be too strong

In some cases our condition of active ignorance might predict presuppositions that are too strong.

Consider first what would happen if a noun *P* were irrelevant to a presupposition *Q* in the sentence *[Each P]* $\underline{Q}Q'$. We would require that for every *P'*, the presupposition of *[Each P']* $\underline{Q}Q'$ be satisfied. When *P'* is tautologous, this yields a presupposition that *every individual in the domain* satisfies *Q* – which is implausibly strong. One possible explanation (a stipulative one) is that head nouns are never disregarded, possibly because they tend to denote natural kinds. At this point, we leave the status of nouns for future research.[24]

A similar problem arises when one adopts a more realistic analysis of subjunctive conditionals (as opposed to our simplified analysis of conditionals *qua* material implications). Following Stalnaker 1968 and Lewis 1973, one usually treats a subjunctive conditional *if p, q* as meaning: *the closest p-worlds (from the world of evaluation) satisfy q*. For a subjunctive conditional of the form *if p,* $\underline{q}q'$, we might predict presuppositions that are far too strong when *p* is irrelevant to *q*. For if so, we will require that for every *p'* the presupposition of *if p',* $\underline{q}q'$ should be satisfied. For sentences of this form, whose antecedent is non-presuppositional, a theory of projection should at least require that the closest *p'*-worlds should satisfy q.[25] But if the language is sufficiently expressive, for every world w there will exist a *p'* such that w is one of closest *p'*-worlds from the world of evaluation; which would yield the absurd prediction that all worlds whatsoever (not just those in the context set) should satisfy *q*!

A full exploration of this problem is left for future research. But we note that it is reasonable to assume that *if*-clauses, like other quantificational or referential expressions, come with implicit domain restrictions. As long as *these* are never irrelevant, we will obtain much weaker, and possibly correct, predictions. If we write as *D* the domain restriction in question, we obtain a requirement that for every *p'*, the presupposition of if^D *p',* $\underline{q}q'$ should be satisfied – which at most will yield a presupposition that all worlds within the domain restriction *D* should satisfy *q*. (For von Fintel 2001, the non-monotonic semantics of conditionals *reduces* to a proper understanding of how domain restrictions are fixed in discourse.)

An alternative would be to restrict the space of lexical alternatives so that in *if p, q* we only consider {p, T, F} as alternatives to *p*. If so, the problem disappears: since the closest world to a world of evaluation w is w itself, *if T,* $\underline{q}q'$ will yield the same presupposition as $\underline{q}q'$, as is desired; and presumably the presupposition of *if F,* $\underline{q}q'$ will be vacuously satisfied.

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[24] An alternative analysis could be explored, in terms of implicit domain restrictions. The idea would be that in all cases we have a domain restriction that prevents the universal presupposition obtained by ignoring the head noun from having too broad a scope. But as a referee notes, this would still fail to yield the right results: if there are 20 people in the room, 10 of whom are students, and 10 of whom are professors, the sentence *None of the students has stopped smoking* is not likely to give rise to the inference that all *20* people used to smoke. But this is precisely what would be predicted if *students* were ignored, on the plausible assumption that the domain restriction includes all the people present in the room.

[25] Heim 1992 defines a more sophisticated semantics for subjunctive conditionals, but this is to deal with presupposition triggers that are in the antecedent. When the antecedent is presupposition-free, her analysis is identical to the Lewis/Stalnaker theory (more precisely: to Lewis's theory together with the Limit Assumption; Lewis 1973).

4.3.2 Attitude reports

The sentences in (37) give rise to two inferences: (i) that the presupposition of the embedded clause is true (hence that it was in fact raining); and (ii) that the agent believes it to be true too (so that John believes that it was raining).

(37) a. John believes that it has stopped raining.
b. Does John believe that it has stopped raining?

Heim 1983, 1992 only predicts the inference (i) (i.e. a presupposition that *John believes that it was raining*); it needs a strengthening mechanism to obtain inference (ii) (DRT, for its part, can predict inference (ii), and needs a strengthening mechanism to obtain inference (i).) We leave a deeper discussion of this case for future research, but make some preliminary remarks about its treatment.

1. We get the correct results if we take the alternatives to *believe* to be {believe, id}, where *id* is a verb of the same type of *believe*, which just returns the value of its propositional argument.[26] With these alternatives, we get the two conditions in (38).

(38) C^+ should satisfy the presupposition of:
(i) *John believes that it has stopped raining* – which in Heim's theory implies that $C^+ \models$ John believes that it was raining.
(ii) *John id that it has stopped raining*, which has the same meaning as *It has stopped raining* – hence a presupposition that it was in fact raining.

2. Importantly, we cannot allow Alt(believe) to include all conceivable expressions with meanings of the same type as *believe*: this would make absurdly strong predictions. For instance, we wouldn't want C^+ to be forced to satisfy the presupposition of *John dreams that it has stopped raining,* as this would presumably trigger a presupposition that *John dreams that it was raining*. Clearly, a very restricted set of alternatives is necessary in this case – and a more sophisticated theory of lexical alternatives will have to be developed.

3. Finally, an extension of the notion of 'irrelevance' would be needed in this case to determine whether *believe* is or is not ignored by the accommodation procedure (the extension is needed because *believe* is not of the right type for irrelevance to be computed).[27]

4.3.3 Solomon's objection

Mike Solomon (p.c.) has noticed that 'active ignorance' must be refined when we consider sentences with several triggers:

(39) Since John is obnoxious, his wife will leave him. (= *since p, qq'*) (Solomon, p.c.)

There are two presupposition triggers in (39): *since* triggers the presupposition that John is in fact obnoxious; and *his wife* triggers the presupposition that John has a wife. Now suppose that John's being obnoxious (= *p*) is irrelevant to his having a wife (= *q*). We are forced to strengthen the original context set C into a context C^+ which satisfies a variety of alternatives

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[26] If *believe* is of type <st, <e, st>>, the value **id** of *id* is defined by: **id** $= \lambda p_{st} . \lambda x_e . p$.

[27] For instance, we may appeal to the procedure outlined in (i) in footnote 21. In *John believes that pp'*, *believes* is not of the same type as *p*. However, the existential closure $\exists x_e\ \exists y_{st}\ x$ *believes y* is of the same type as *p*, hence we may apply a putative Selection algorithm to this case. Given the weakness of the existentially closed statement, it is likely to lead us to actively ignore *believe* in most cases.

of (39), of the form *since p', $\underline{q}q'$*, for a variety of clauses *p'*. Among them is the contradiction *F*. But now we conclude, absurdly, that C^+ must satisfy the presuppositions of *since F, $\underline{q}q'$* – and hence in particular that it must satisfy a contradiction!

Intuitively, we would like to check presuppositions 'one by one', treating the material other than the target expression *$\underline{q}q'$* as being non-presuppositional. For theories of presupposition projection which are based on a bivalent semantics, such as Schlenker 2008, 2009, this is trivial to implement: when we compute the presupposition of the alternatives *since p', $\underline{q}q'$*, we treat the *since*-clause as bivalent, in effect computing only the presuppositions that are due to *$\underline{q}q'$*; in particular, we do not get the undesirable effect that the contradiction *F* needs to be presupposed. For other theories of presupposition, we will have to state a more cumbersome stipulation; but since all theories have a version of local accommodation, which in effect treats a presupposition as if it were part of the assertive component, we may posit that all expressions except the target *$\underline{q}q'$* are treated as if they had their bivalent meaning, obtained by applying local accommodation. The present amendment leads to a revised statement of the rule of presupposition accommodation to which we have added the clause that appears in bold in (40).

(40) Presupposition Accommodation (revised version)
If a sentence *S* is uttered in a context set C and if *d* requires global accommodation with respect to C, the accommodated context set C^+ is the most conservative restriction of C such that:

for all strings *a*, *b* and all presupposition triggers *$\underline{d}d'$* such that *S* = *a $\underline{d}d'$ b*, for all *S'* ∈ Alt_C(a_b; $\underline{d}$d'), C^+ satisfies the presuppositions of *S'*, **where all presupposition triggers found in *S'* except *$\underline{d}d'$* are treated as bivalent.**

5 Concluding Remarks

Three of the most articulated contemporary accounts of the Proviso Problem, DRT, Singh's Formal Alternatives, and Singh's Interacting Alternatives, face non-trivial difficulties. Most significantly, DRT makes incorrect predictions about simple instances of presupposition projection in quantified structures; it cannot deal with some further instances of the Proviso Problem that involve quantifiers; and it cannot deal with semi-conditional presuppositions. Singh's first theory ('Formal Alternatives') solves several important problems (at least in the propositional case), but it has to stipulate the form of the space of hypotheses that are considered for accommodation, and it relies on an additional level of representation. Singh's second theory ('Interacting Alternatives') derives the hypothesis space from the theory of implicatures, but it faces empirical and conceptual difficulties. Our solution is based on a relatively simple idea: when we compute the presupposition of a sentence, we try to actively ignore any material which seems to be irrelevant to the presupposition. While one should develop a theory of which material counts as 'irrelevant' (= the Selection problem), we concentrated on developing a theory that explains *how* material is ignored (= the Strengthening problem). Our theory yields adequate results in many simple cases, and it predicts new instances of the Proviso Problem that seem to be instantiated. Furthermore, the mechanism it posits – active ignorance of certain irrelevant expressions – is formally similar to one which is already used by several recent accounts of the linear bias found in presupposition projection. Still, several open problems remain – notably in conditionals and attitude reports – which will require a better understanding of the alternatives that are involved in the process of 'active ignorance'. And the Selection problem has yet to be grappled with.

More generally, we hope to have shown that the Proviso Problem is *not* an argument in favor of purely representational theories of presupposition projection. Our solution is compatible with standard semantic theories; and it is particularly close to the spirit of several recent semantic/pragmatic accounts.

References

Beaver, David: 2001, *Presupposition and Assertion in Dynamic Semantics*. CSLI, Stanford.

Beaver, David and Krahmer, Emiel: 2001, A Partial Acccount of Presupposition Projection. *Journal of Logic, Language and Information* 10(2): 147-182.

Beaver, David and Zeevat, Henk: 2007, Accommodation. In Ramchand, G. and C. Reiss (eds.), *Oxford Handbook of Linguistic Interfaces*, Oxford University Press.

Charlow, Simon: 2009, Strong predicative presuppositions. Slides, workshop on 'New Directions in the Theory of Presupposition', ESSLLI 2009, Bordeaux.

Chemla, Emmanuel: 2008, Similarity: Towards a unified account of scalar implicatures, free choice permission and presupposition projection. Under revision for *Semantics and Pragmatics*.

Chemla, Emmanuel: 2009, Presuppositions of quantified sentences: Experimental Data. *Natural Language Semantics* 17, 4: 299-340

Chemla, Emmanuel and Schlenker, Philippe: 2011a, Incremental vs. Symmetric Accounts of Presupposition Projection. Manuscript, LSCP and Institut Jean-Nicod.

Chemla, Emmanuel and Schlenker, Philippe: 2011b, The Reality of Conditional Presuppositions. Manuscript, LSCP and Institut Jean-Nicod.

von Fintel, Kai: 2001, Counterfactuals in a Dynamic Context. In *Ken Hale - A Life in Language*, Michael Kenstowicz (ed.), The MIT Press: 123-152

Fox, Danny: 2007, *Free choice disjunction and the theory of scalar implicature*. In Uli Sauerland and Penka Stateva, editors, Presupposition and Implicature in Compositional Semantics, pages 71–120. Palgrave Macmillan, New York, NY, 2007.

Fox, Danny: 2008, Two Short Notes on Schlenker's Theory of Presupposition Projection. *Theoretical Linguistics* 34, 3: 237–252

George, Benjamin: 2008a, Predicting Presupposition Projection: Some alternatives in the strong Kleene tradition. Manuscript, UCLA. Available on Semantics Archive at http://semanticsarchive.net/Archive/DY0YTgxN/

George, Benjamin: 2008b, Presupposition Repairs: A Static, Trivalent Approach to Predicting Presupposition. MA thesis, UCLA. Available on Semantics Archive at http://semanticsarchive.net/Archive/2ZiYmEyN/

Geurts, Bart: 1996, Local Satisfaction Guaranteed: a presupposition theory and its problems. *Linguistics and Philosophy* 19, 3: 259-294

Geurts, Bart: 1999, *Presupposition and Pronouns*. Elsevier.

Heim, Irene: 1983, On the Projection Problem for Presuppositions. In D. Flickinger et al. (eds), *Proceedings of the Second West Coast Conference on Formal Linguistics*, 114-125. Reprinted in Davis 1991.

Heim, Irene: 1992, Presupposition projection and the semantics of attitude verbs. *Journal of Semantics*, 9(3), 183-221. DOI 10.1093/jos/9.3.183

Heim, Irene: 2006, A Note on the Proviso Problem. Handout from Milan Meeting, Gargnano, 2006.

Karttunen, Lauri: 1974, Presupposition and Linguistic Context. *Theoretical Linguistics* 1: 181-194. Reprinted in Davis 1991.

Lakoff, George: 1971, The Role of Deduction in Grammar, in: Fillmore, C. J and D. T. Langendoen (Eds.) *Studies in Linguistic Semantics*, New York, N. Y.: Holt, Rinehart, and Winston.

Lewis, David: 1973, *Counterfactuals,* Harvard

Peters, Stanley: 1979, A truth-conditional formulation of Karttunen's account of presupposition. *Synthese*, 40:301-316.

Rothschild, Daniel: 2008a, Presupposition Projection in Dynamic Semantics. Manuscript, Columbia University.

Rothschild, Daniel: 2008b, Transparency Theory and its Dynamic Alternatives. *Theoretical Linguistics* 34, 3: 261–268.

Rothschild, Daniel: 2008, Presupposition Projection and Logical Equivalence. *Philosophical Perspectives* 22 (1):473-497

Schlenker, Philippe: 2008, *Be Articulate:* A Pragmatic Theory of Presupposition Projection. *Theoretical Linguistics,* 34, 3: 157-212

Schlenker, Philippe: 2009, Local Contexts. *Semantics & Pragmatics,* Volume 2, Article 3: 1-78, doi: 10.3765/sp.2.3Soames, Scott: 1989, Presupposition. In D. Gabbay and F. Guenthner (eds), *Handbook of Philosophical Logic IV*, 553-616.

Schlenker, Philippe: 2010, Presuppositions and Local Contexts. *Mind* 119, Issue 474: 377-391.

Schlenker, Philippe: to appear, DRT with Local Contexts. To appear in *Natural Language Semantics*.

Singh, Raj: 2006, A Solution to the Proviso Problem: Formally Defined Alternatives and Relevance. Manuscript, MIT.

Singh, Raj: 2007, Formal alternatives as a solution to the proviso problem. In Tova Friedman and Masayuki Gibson, editors, Proceedings of SALT 17, pages 264–281.

Singh, Raj: 2008, Modularity and locality in interpretation. Doctoral Dissertation, MIT, 2008.

Singh, Raj: 2009, Symmetric and interacting alternatives for implicature and accommodation. In Nathan Klinedinst and Daniel Rothschild, editors, *Proceedings of the ESSLLI 2009 Workshop: New Directions in the Theory of Presupposition*. 2009.

Stalnaker, Robert, 1968; A Theory of Conditionals, *Studies in Logical Theory, American Philosophical Quaterly,* Monograph: 2.

van Rooij, Robert: 2007, Strengthening Conditional Presuppositions. *Journal of Semantics,* 2007, 24: 289-304. DOI 10.1093/jos/ffm007

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