Be Articulate: A pragmatic theory of presupposition projection*

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Abstract

In the 1980's, the analysis of presupposition projection contributed to a 'dynamic turn' in semantics: the classical notion of meanings as truth conditions *was replaced with a dynamic notion of* meanings as Context Change Potentials *(Heim 1983). We explore an alternative in which presupposition projection follows from the combination of a fully classical semantics with two pragmatic principles of manner,* Be

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Articulate *and* Be Brief. Be Articulate *is a violable constraint which requires that a meaning* pp′*, conceptualized as involving a pre-condition* p *(its 'presupposition'), should be articulated as* … (p and pp′) … *(e.g.* … it is raining and John knows it …*) rather than as* … pp′…. Be Brief, *which is more highly ranked than* Be Articulate, *disallows a full conjunction whose first element is semantically idle. In particular,* … (p and pp′) … *is ruled out by* Be Brief – *and hence* … pp′ … *is acceptable despite* Be Articulate – *if one can determine as soon as* p *and is uttered that no matter how the sentence ends these words could be eliminated without affecting its contextual meaning. Two equivalence theorems guarantee that these principles derive Heim's results in almost all cases. Unlike dynamic semantics, our analysis does not encode in the meaning of connectives the left-right asymmetry which is often found in presupposition projection; instead, we give a flexible analysis of this incremental bias, which allows us to account for some 'symmetric readings' in which the bias is overridden (e.g.* If the bathroom is not hidden, this house has no bathroom*).*

In the early 1980's, two problems precipitated a 'dynamic turn' in the analysis of meaning: the puzzle of 'donkey anaphora', and the analysis of 'presupposition projection'. In 'donkey' sentences, an existential quantifier appears to bind a pronoun that does not lie within its syntactic scope:

(1)   a.   Every farmer who owns <u>a donkey</u> beats <u>it</u>.
      b.   John owns <u>a donkey</u>. He beat <u>it</u>.

The phenomenon occurs both intra- and inter-sententially, which suggests that the same mechanism should account for both cases. The dynamic solution (Kamp 1981; Heim 1982) located the problem in the indefinite, which was re-analyzed as a 'discourse referent' whose existential force stemmed from the very architecture of the interpretive procedure, duly re-defined along dynamic lines. It was soon (re-)discovered, however, that a considerably less drastic solution was open as well. In the so-called 'E-type' approach (Evans 1980, Ludlow 1994, Heim 1990, Neale 1990, Elbourne 2005), the source of the problem is located in the pronoun rather than in the indefinite. The latter is left to lead a relatively unexceptional life as an existential quantifier (I say 'relatively' because the account must be stated within an event- or situation-theoretic framework, which leads to important complications); the pronoun, by contrast, is taken to go proxy for a definite description, for instance *the donkey that he has* in the examples in (1). While the debate is by no means settled, it is

fair to say that the E-type approach has taken away a significant part of the first motivation for the dynamic approach[2]. Thus its fortune rests in large part on the analysis of presupposition projection[3]. The basic problem is illustrated in (2):

(2) a.   The king of Moldavia is powerful.
     b.   Moldavia is a monarchy and the king of Moldavia is powerful.
     c.   If Moldavia is a monarchy, the king of Moldavia is powerful.

(2)a presupposes (incorrectly, as it happens) that Moldavia has a king, but the examples in (2)b–c require no such thing; they only presuppose that *if Moldavia is a monarchy, it has a king* (this condition is satisfied if one assumes that monarchies in Eastern Europe are patrilineal, as the French system used to be). The dynamic analyses developed by Stalnaker (1974), Karttunen (1974) and Heim (1983) offer a highly explicit account of these differences. What makes these accounts *dynamic* is that the various parts of a sentence or discourse are typically not evaluated in the original context in which it is uttered, but rather in the context obtained by first computing the effect of other expressions. The relevant notion of context is here the 'context set', which represents what the speech act participants take for granted at any moment[4]. Thus the basic idea is that *the king of Moldavia is powerful* in (2)b is not evaluated with respect to the initial context set C, but rather with respect to C *as modified* by the

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[2]   The reason the E-type approach requires situations or events is that it must ensure that the pronouns *qua* definite descriptions are evaluated with respect to states of affairs that are 'small enough' to guarantee that their uniqueness conditions are satisfied. In the end, the question is whether the situations / events of the E-type analysis are as fined-grained as the assignment functions that are quantified over in the dynamic approach. If so, the two approaches might be partly inter-translatable. See Dekker 1997 and Elbourne 2005; see also Chierchia 1995 for a general discussion of dynamic semantics.

[3]   In fact, since definite descriptions are a variety of presuppositional expressions, the E-type approach itself depends on an account of presupposition projection to explain how the existence and uniqueness conditions on an E-type pronoun can come to be satisfied. In principle, then, the present account could be combined with a full theory of pronouns-as-descriptions (as in Elbourne 2005) to yield an analysis of donkey anaphora.

[4]   This is sometimes referred to as the 'common ground'. The common ground is often seen as a set of propositions, whereas the context set is the set of possible worlds / contexts that make true *each* of these propositions. When such a terminology is adopted, the context set is the intersection of the propositions in the common ground.

assumption that Moldavia is a monarchy – hence the very weak presupposition that we obtain for the entire sentence.

We will argue that the dynamic approach is misguided, and that it faces a dilemma. Stalnaker's theory is its pragmatic horn: it offers an explanatory account of presupposition projection in conjunctions, but as stated it fails to generalize to other connectives and operators. Karttunen's and Heim's analyses are its semantic horn: they offer descriptively adequate accounts of a wide range of data, but they fail to be predictive or explanatory. We will suggest that the heart of the difficulty lies in the first step of the dynamic approach, which posits that some expressions must be evaluated with respect to a context set which is not the initial one. We will offer an alternative that is entirely developed within classical (i.e. bivalent and pre-dynamic) logic. Although its inspiration is squarely pragmatic, our theory leads to a formally explicit projection algorithm. In a nutshell, we suggest that a presupposition is a distinguished part of a bivalent meaning, one that strives to be articulated as a separate conjunct. Thus if pp' is a clause with a presupposition p (which we indicate by underlining) and an assertive component p', a pragmatic principle of manner, *Be Articulate*, requires that *if possible* the sentence should be expressed as *(p and pp')* rather than simply as *pp'*. Thus *Be Articulate* requires that, whenever possible, one should say *It is raining and John knows it* rather than just *John knows that it is raining*. This principle is controlled by another principle of manner, *Be Brief*, which sometimes prohibits that a conjunction be uttered if its first conjunct is certain to be idle given the rest of the sentence. The interaction of these two principles will be shown to provide a completely general analysis of presupposition, one that derives almost all of Heim's results in the simple cases, while also accounting for a number of 'symmetric readings' when the theory is refined.

The rest of this article is organized as follows. We start by reminding the reader of the dynamic approach and of its difficulties (Section 1). We then develop a basic version of our alternative which can match the results of Heim 1983 in almost all cases (Section 2). Finally, we ask whether *Be Brief* should be verified incrementally (taking into account just those words that have been heard up to a given point), or symmetrically (taking into account all of the sentence); we argue that both versions of the principle are needed, which gives rise to graded judgments and an analysis of a

number of 'symmetric readings' (Section 3). Various extensions and problems are discussed in the Appendix.

1.   The dynamic dilemma[5]

1.1.   *The pragmatic horn*

The dynamic analysis of presuppositions draws its main inspiration from Stalnaker's influential analysis of presupposition projection in conjunctions. The main goal is to explain why (2)a above presupposes that Moldavia is a monarchy, while (2)b doesn't:

'... when a speaker says something of the form *A and B*, he may take it for granted that *A* (or at least that his audience recognizes that *he* accepts that A) after he has said it. The proposition that *A* will be added to the background of common assumptions before the speaker asserts that *B*. Now suppose that *B* expresses a proposition that would, for some reason, be inappropriate to assert except in a context where *A*, or something entailed by *A*, is presupposed. Even if *A* is *not* presupposed initially, one may still assert *A and B* since by the time one gets to saying that *B*, the context has shifted, and it is by then presupposed that *A*.' (Stalnaker 1974)

Using current formalism, Stalnaker's analysis may be summarized as follows:

 (i)   The presupposition of an elementary clause imposes a condition on the context set, i.e. on the set of worlds compatible with what the speech act participants take for granted. Thus if pp' is an elementary clause with presupposition p and assertion p', the felicity condition is that for each $w \in C$, $p(w) = 1$ (we will henceforth underline the presuppositional component of a clause or predicate). If this condition is not satisfied, a presupposition failure (denoted by #) is obtained. If we write as $C[pp']$ the effect of asserting pp' in C, we obtain the rule in (3):

(3) $C[\underline{p}p'] = \#$ unless for each $w \in C$, $p(w) = 1$.

(ii)   The context set does not remain fixed but rather *evolves dynamically* in the course of a discourse and even within the confines of a single sentence. In particular, if $\underline{pp}'$ is an elementary clause uttered in C, and if it does not trigger a presupposition failure, it has the effect of updating C with p', its assertive component:

(4)   If $\neq$ #, $C[\underline{pp}'] = \{w \in C, p'(w) = 1\}$

(iii) Finally, Stalnaker assimilates the assertion of a conjunction to the successive assertion of each conjunct. As he writes, 'when a speaker says something of the form *A and B*, he may take it for granted that *A* (…) after he has said it.' This leads us to the following update rule for conjunctions:

(5)   C[F and G] = # iff C[F] = # or (C[F] $\neq$ # and C[F][G] = #). If $\neq$ #, C[F and G] = C[F][G].

Since *Moldavia is a monarchy* does not contain any presupposition trigger, by Principles (i) and (ii) the effect of the first conjunct of (2)b is to turn the initial context set C into C′, with C′ = C[Moldavia is a monarchy] = {w ∈ C: Moldavia is a monarchy in w}. By Principle (iii), the presupposition that Moldavia has a king is evaluated not with respect to C, but with respect to C′. And the presupposition is predicted to be satisfied just in case for each w ∈ C, if Moldavia is a monarchy in w, Moldavia has a king in w.

This account has the ring and the simplicity of truth. It has proven immensely influential; but on closer inspection it raises three difficulties: it conflates the belief that *p* has been asserted with the belief that *p* is true; it fails to generalize to conjunctions that are embedded under other operators; and it fails to apply to other connectives, even when they are not embedded (see also Moltmann 1997, 2003 for a critique of the notion of 'intermediate context').

(i)   As emphasized in Stalnaker 2002, presuppositions must be 'common belief' between the speech act participants: each should believe them, should believe that each believes them, etc. In particular, if you tell me that *Mary knows that the President is an idiot*, the pragmatics of presupposition requires that I really do consider the President as an idiot. This may or may not be the case, but if it's not, the chances are slim that I will change my mind simply because

you started your sentence with *The President is an idiot and.* . . . So it is unreasonable to assume that after I have heard these five words I will take for granted that the President really is an idiot for the sole reason that you said it. Contrary to what Stalnaker 1974 writes in the passage quoted above, it is thus *false* that the speaker 'may take it for granted that *A* (. . .) after he has said it'. On the other hand, it *is* true, as Stalnaker writes in the parentheses I slyly suppressed, that the speaker may take it for granted 'that his audience recognizes that *he* accepts that A'. But this won't help. When my interlocutor John tells me that *Mary knows that the President is an idiot*, I may know full well that *John* takes the President to be an idiot; but this won't make his presupposition less objectionable if I happen to disagree: my interlocutor should not make this presupposition because it has not been established that *I*, the addressee, consider the President to be an idiot[6].

(ii) Even if one restricts attention to conjunctions, Stalnaker 1974 faces serious problems when *and* is embedded. If I say that *I have never met an academic who was an idiot and who knew it*, I am not asserting of anybody that he is an idiot, for the simple reason that the predicate is in the scope of a negative adverbial. It is unclear how Stalnaker's analysis, which is based on a notion of *assertion*, can be extended to embedded cases of this sort.

(iii) If one considers other operators (whether embedded or not), it is also hard to see how the account can generalize. For instance, the entire point of a disjunction is that one can assert it without being committed to either disjunct. But there are non-trivial presuppositional facts to account for in disjunctions as well. Thus the sentence *John isn't incompetent, or he knows that he is* presupposes nothing; in this case, it is the *negation* of the first disjunct that appears to justify the presupposition of the second. This fact should follow from a theory of presupposition projection, but it is unclear how it can be

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6   In recent work, Stalnaker (2002) bases important arguments on the assumption that what is taken for granted for purposes of presupposition theory really is common belief in the technical sense. I find his recent analyses enlightening, but I do not see how they can be reconciled with those of Stalnaker 1974, or for that matter with the spirit of dynamic semantics.

derived within Stalnaker's assertion-based analysis. Similar worries and difficulties arise when one tackles presupposition projection in quantified statements.

1.2. *The semantic horn*

Heim 1983, building on Karttunen 1974, developed a semantic account that circumvents these difficulties. Instead of deriving the update rules from some pragmatic reasoning applied on top of a standard semantics, Heim posits that lexical items are dynamic from the get-go. Thus the update rule in (5) can be preserved, but it is reinterpreted – it now follows directly from the semantics of *F and G*, which can be seen as a (partial) function from context sets to context sets. This semantic reinterpretation of Stalnaker's pragmatic ideas makes it possible to extend the dynamic framework to arbitrary connectives and operators[7]. Specifically, Heim's approach can handle a full fragment such as the one in (6), in which both predicates and propositions may be presuppositional[8]:

(6) **Syntax**
  – Generalized Quantifiers: $Q ::= Q_i$
  – Predicates: $P ::= P_i \,|\, \underline{P_i} P_k$
  – Propositions: $p ::= p_i \,|\, \underline{p_i} p_k$
  – Formulas $F ::= p \,|\, (\text{not } F) \,|\, (F \text{ and } F) \,|\, (F \text{ or } F) \,|\, (\text{if } F.F) \,|\, (Q_i\ P.P)$

We give in (7) update rules that are in full agreement with Heim's dynamic analysis, except for disjunction, which she does not discuss (here we follow Beaver 2001).

On a technical level, we assume that each generalized quantifier Q_i is associated with a 'tree of numbers' f_i, (van Benthem 1986, Keenan 1996) which associates a

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7 Another advantage is that it frees Heim's theory from Stalnaker's dubious assumptions about belief revision in discourse. In particular, Heim need not be committed to the claim that 'intermediate context sets' literally represent what is common belief at some points in the conversational exchange.

8 To see a predicative example, consider *stopped smoking*, which presupposes *used to smoke* and asserts *doesn't smoke*.

truth value to each pair of the form *(a, b)* with *a* = the number of elements that satisfy the restrictor but not the nuclear scope and *b* = the number of elements that satisfy both the restrictor and the nuclear scope. We write F^w for the value of the expression *F* at the world w. And when certain elements are optional, we place angle brackets ($\langle\ \rangle$) around them and around the corresponding part of the update rules.

(7) **Dynamic Semantics**

$C[p] = \{w \in C\colon p^w = 1\}$

$C[\underline{p}p'] = \#$ iff for some $w \in C$, $p^w = 0$; if $\neq \#$, $C[\underline{p}p'] = \{w \in C\colon p'^w = 1\}$

$C[(\text{not } F)] = \#$ iff $C[F] = \#$; if $\neq \#$, $C[(\text{not } F)] = C - C[F]$

$C[(F \text{ and } G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \#$ and $C[F][G] = \#)$; if $\neq \#$, $C[(F \text{ and } G)] = C[F][G]$

$C[(F \text{ or } G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \#$ and $C[\text{not } F][G] = \#)$; if $\neq \#$, $C[(F \text{ or } G)] = C[F] \cup C[\text{not } F][G]$

$C[(\text{if } F . G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \#$ and $C[F][G] = \#)$; if $\neq \#$, $C[(\text{if } F . G)] = C - C[F][\text{not } G]$

$C[(Q_i\ \langle\underline{P}\rangle P' . \langle\underline{R}\rangle R')] = \#$ iff $\langle$for some $w \in C$, for some $d \in D$, $P^w(d) = 0\rangle$ or $\langle$for some $w \in C$, for some $d \in D$, $\langle P^w(d) = 1$ and$\rangle$ $P'^w(d) = 1$ and $R^w(d) = 0\rangle$. If $\neq \#$,

$C[(Q_i\langle\underline{P}\rangle P' . \langle\underline{R}\rangle R')] = \{w \in C\colon f_i(a^w, b^w) = 1\}$ with $a^w = \{d \in D\colon P'^w(d) = 1$ and $R'^w(d) = 0\}$, $b^w = \{d \in D\colon P'^w(d) = 1$ and $R'^w(d) = 1\}$

While it is important that such an account can be stated explicitly, the details won't matter immediately. However the following general properties should be kept in mind:

(i) Conjunction and disjunction, which in classical logic treat their two arguments symmetrically, are asymmetric in this dynamic framework. Thus we predict that *Moldavia is a monarchy and the king of Moldavia is powerful* presupposes something very weak, as discussed above. By contrast, if we do not already assume that Moldavia has a king, *The king of Moldavia is powerful and Moldavia is a monarchy* should be infelicitous because the presupposition of the first conjunct isn't satisfied in its local context. Similarly, *Moldavia is not a monarchy or else the king of Moldavia is powerful* is predicted to have a very weak presupposition, namely that *if Moldavia*

is a monarchy, it has a king. But reversing the order of the disjuncts should yield a failure unless we initially take for granted that Moldavia is a monarchy (this prediction is discussed in greater detail below).

(ii)   A negation *(not F)* has the same presuppositional behavior as *F*. And a conditional *(if F. G)*, treated here as a dynamic form of material implication, has the same presuppositional behavior as a conjunction *(F and G)*.

(iii) Quantified statements of the form *(QPP′. R)* or *(QP. RR′)* are predicted to have very strong presuppositions. In the first case, the requirement is that *every individual in the domain satisfies the presupposition of the restrictor*. In the second case, one must guarantee that *every element that satisfies the restrictor also satisfies the presupposition of the nuclear scope*. This appears to be right in at least some cases – e.g. *None of my friends knows that he'll be unemployed* presupposes that each of my friends will be without a job.

Despite these impressive achievements, the semantic approach has a major weakness: it buys its descriptive success at the price of explanatory depth. In essence, the problem is that the dynamic framework is just *too powerful*. Heim 1983 hoped that the Context Change Potentials of connectives would be fully determined by their truth-conditional meaning, but as Soames (1989) and Heim herself (1990b[9], 1992) emphasized, this is not so. We can easily define a deviant conjunction *and** which is equivalent to *and* in non-presuppositional cases, but which has a different projective behavior:

(8)   C[F and* G] = # iff C[G] = # or (C[G] ≠ # and C[G][F] = #). If ≠ #, C[F and* G] = C[G][F].

It is immediate that when neither *F* nor *G* contains any presupposition trigger, C[F and* G] = C[F and G], because in this case the order of the conjuncts does not matter. In general, however, the semantics of *and** specifies that the update process is performed in the opposite order from that determined by *and*: C[F and* G] = C[G and F]. For this reason,

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[9]   Heim credits Mats Rooth (in a letter written in 1986) for the observation that her account of presupposition projection overgenerates.

Moldavia is a monarchy and* the king of Moldavia is powerful is predicted to have the presupposition that Moldavia is a monarchy. The obvious question is: *why does natural language have* and *but not* and*? Heim's dynamic framework has no answer to offer. By contrast, this problem did not arise for Stalnaker, since for him it was ultimately the *linear order* of the conjuncts that was responsible for the difference in their projective behavior (if one hears *F and G*, one hears *F* before *G*, and thus one must first update the context set with *F*, and only then with *G*). The analysis we are about to develop sides with Stalnaker on this issue: linear order, combined with some pragmatic principles of manner, will suffice to derive Heim's results.

A correlate of this problem of overgeneration is that Heim's analysis only makes very weak predictions about connectives whose Context Change Potentials are not stipulated to begin with. Consider *unless*, with the simplifying assumption that *unless F, G* is truth-conditionally equivalent to *if not F, G*. The following Context Change Potentials are all compatible with this observation:

(9) a. C[unless F, G] = # iff C[F] = # or (C[F] ≠ # and C[(not F)][G] = #).
         If ≠ #, C[unless F, G] = C - C[(not F)][(not G)]
     b. C[unless F, G] = # iff C[F] = # or C[F][G] = #.
         If ≠ #, ... (as in (a)).
     c. C[unless F, G] = # iff C[F] = # or C[G] = #.
         If ≠ #, ... (as in (a)).
     d. C[unless F, G] = # iff C[G] = # or (C[G] ≠ # and C[(not G)][F] = #).
         If ≠ #, C[unless F, G] = C - C[(not G)][F]

Consider now the sentence in (10):

(10) Unless John didn't come, Mary will know that he is here.

(10) presupposes that *if John came, he is here*. This is exactly the prediction made by (9)a: since the *unless*-clause contains no presupposition trigger, the presupposition is that C[(not F)][G] ≠ # with *F = John didn't come* and *G = John is here*. The result immediately follows. By contrast, (9)b predicts that (10) should presuppose that *if John didn't come, he is here* – an incorrect result. (9)c predicts a presupposition that *John is*

here, which is probably too strong. Conceivably, (9)b and (9)c could be ruled out by requiring that the formulas of the form $C'[F']$ that appear in the definedness conditions be the same as those that appear in the update rules themselves. However, this strategy won't suffice to rule out (9)d: building on the equivalence between *if not F, G* and *if not G, F*, we have provided in (9)d definedness-*cum*-update rules that are quite natural. But the predicted presupposition (i.e. that *John is here*) is probably incorrect. Heim's theory has no way of explaining why (9)a is correct but (9)d isn't. We will see shortly that our alternative theory, by contrast, makes the correct prediction.

   In the rest of this article, our primary targets are the dynamic theories of Stalnaker and Heim. We will not discuss in any detail the analysis of Gazdar 1979, which shares with the present account the goal of providing a theory which is both pragmatically motivated and formally predictive, but was taken by subsequent accounts to be empirically flawed. We will also fail to do justice to the debate between dynamic semantics and theories of projection developed within Discourse Representation Theory (van der Sandt 1992, Geurts 1999); although preliminary remarks are found in the Appendix, a detailed comparison is left for future research. Similarly, we won't attempt a comparison with other pragmatically-inspired accounts such as Sperber and Wilson 1989 and Abbott 2000, which contain highly suggestive ideas but do not offer precise projection algorithms. Finally, we leave for future research a comparison with the non-dynamic, trivalent theory of Peters 1975/1979, which is currently undergoing a revival (George 2007, 2008, Fox 2007).

2. Incremental Transparency

We locate the source of the dilemma outlined above in the *first step* of the dynamic approach, namely the assumption that the context set needs to be updated with the content of certain expressions. Two points should be emphasized, however.

(i)   We do not deny that the presuppositions of a sentence must be evaluated with respect to a context set. We take it to be obvious that the sentence *John knows that it is raining* is or isn't felicitous depending

on what the speech act participants take for granted, i.e. on the context set.

(ii) We do not even deny that the context set is updated as a discourse or sentence is heard. But the only update which we take to be a necessary part of presupposition projection concerns the fact that *certain words were uttered*. To make the point entirely clear, let us consider a piece of discourse uttered by John to Mary:

(11)   (i) Moldavia is a monarchy. (ii) Its king is powerful.

– Dynamic approaches posit that at the beginning of Step (ii) the context set has been updated with the information that Moldavia is a monarchy.

– We deny this. But we accept that at the beginning of Step (ii) the context set has been updated with the information that John has said 'Moldavia is a monarchy' (in fact, there were several intermediate steps, at which the context set was successively updated with the information that John said 'Moldavia', 'Moldavia is', 'Moldavia is a', etc). In most standard cases, it will follow that the context set is updated with the information that *John believes* that Moldavia is a monarchy. But this need not imply that it thereby becomes common belief that Moldavia really is a monarchy. If Mary thinks – with good reason – that John doesn't know what he is talking about, she will definitely *not* accept that Moldavia is indeed a monarchy, and *a fortiori* this proposition will not become common belief.

Let us now develop an initial version of the Transparency theory. Like Stalnaker, we seek to derive the projective behavior of operators from their standard semantics and their syntax, combined with some pragmatic reasoning. Like Karttunen and Heim, we offer a fully explicit algorithm to compute the presuppositions of complex sentences from the meanings of their parts. Unlike all dynamic accounts, our theory is entirely developed within classical logic, and it does without any standard notion of context update or even truth value gaps: in our analysis, presupposition failure will not come out as a third truth value, but rather as the violation of a new pragmatic principle, *Be Articulate*; its effects will be controlled by a more traditional Gricean principle, *Be Brief*. To be concrete, we will assume that the syntactic fragment defined in (6) has the semantics

in (12) (as before, we put within angle brackets $\langle$ $\rangle$ those elements that are optional in the syntax, as well as the corresponding parts of the truth conditions):

(12)   **Classical Semantics**
$w \models p$ iff $p^w = 1$
$w \models \underline{p}p'$ iff $p^w = p'^w = 1$
$w \models (\text{not } F)$ iff $w \not\models F$
$w \models (F \text{ and } G)$ iff $w \models F$ and $w \models G$
$w \models (F \text{ or } G)$ iff $w \models F$ or $w \models G$
$w \models (\text{if } F . G)$ iff $w \not\models F$ or $w \models G$
$w \models (Q_i\langle\underline{P}\rangle P' . \langle Q\rangle Q')$ iff $f_i(a_w, b_w) = 1$ with $a_w = \{d \in D:$ $\langle P^w(d) = 1 \text{ and}\rangle$ $P'^w(d) = 1$ and $(\langle Q^w(d) = 0 \text{ or}\rangle$ $Q'^w(d) = 0))\}$, $b_w = \{d \in D: \langle P^w(d) = 1 \text{ and}\rangle$ $P'^w(d) = 1$ and $\langle Q^w(d) = 1 \text{ and}\rangle$ $Q'^w(d) = 1\}$

This semantics is unsurprising, except for the fact that $\underline{d}d'$ is now interpreted, quite simply, as the conjunction of d and d' (underlining thus matters for the pragmatics, not for the semantics). Using this notation, we can symbolize *John knows that it is raining* as $\underline{r}b$ with $r = $ *it is raining*, and $b = $ *John believes that it is raining* (arguably b has a far more subtle meaning, but this won't matter – in our analyses only the presupposition r and the total meaning $\underline{r}b$ will play a role, and we won't have to worry that different results might be obtained if the assertive component were delineated differently). We extend the same notation to predicates, writing $\underline{P}P'$ for *stopped smoking* with $P = $ *used to smoke*, and $P' = $ *doesn't smoke*.

2.1.   *Two principles of manner*

We assume, then, that the 'presupposition' of an elementary clause is just a distinguished part of its bivalent meaning, which is conceptualized as a 'pre-condition' of the whole. For present purposes we take this notion as primitive, and stipulate in the syntax of our logical forms that certain elements are 'pre-conditions' of others[10]. Eventually we would want to

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[10]   I believe I owe the term 'pre-condition' to D. Wilson, who also suggested that an earlier form of the theory be modified.

explain why an entailment e of a meaning m is sometimes conceptualized as a pre-condition of m, but this is really a different question, which doesn't pertain to the Projection Problem, but rather to the Triggering Problem – i.e. to the problem of determining why presuppositions of elementary clauses are generated to begin with[11].

We assume that a pragmatic principle, *Be Articulate*, requires that *whenever possible* the distinguished status of a pre-condition should be made syntactically apparent, and thus that the meaning of an expression $\underline{d}d'$ should be preferably expressed as *(d and $\underline{d}d'$)* (the principle applies whether d is of propositional or predicative type; accordingly, we will take conjunction to be ambiguously propositional or predicative):

(13)   Be Articulate
       In any syntactic environment, express the meaning of an expression
       $\underline{d}d'$ as *(d and $\underline{d}d'$)*
       (... unless independent pragmatic principles rule out the full
       conjunction.)

Be Articulate should ultimately be derived from Grice's 'Maxim of Manner', and specifically from the requirement that one be 'orderly'. For present purposes, however, we take it as primitive.

Be Articulate is sometimes obviated by another Gricean principle of manner, *Be Brief*, which prohibits unnecessary prolixity. We suggest that *the theory of presupposition projection reduces to the interaction between these two principles*. In order to obtain a projection algorithm, each principle must be stated precisely. While *Be Articulate* is relatively trivial, *Be Brief* will come in several versions, one of which leads to predictions that are almost entirely similar to Heim's. Crucially, in the examples that we consider *Be Brief* is never violated, while *Be Articulate* is defeasible. Our analysis may (but need not) be implemented in an optimality-theoretic

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[11]   See Stalnaker 1974, Grice 1981, Simons 2001, Abusch 2002, Kadmon 2001 (Chapter 11) and Schlenker 2006b for possible accounts of the Triggering Problem. L. McNally and C. Potts have both observed that the Transparency theory might run into problems in examples in which the purported presupposition is either extremely difficult or impossible to articulate (as might be the case for some discourse particles, whose presuppositions are often extremely complex). The difficulty is that *Be Articulate* might in such cases make unreasonable demands, which raises questions about the viability of the principle. I leave this as a problem for future research.

framework by positing that *Be Brief* is more highly ranked than *Be Articulate*:

(14)   Be Brief ≫ Be Articulate

Other implementations are possible as well; all that matters is that *Be Articulate* must be satisfied *unless* the result violates *Be Brief*.

   To be concrete, let us consider the sentence S = *John knows that it is raining*. Two competitors must be considered: S, and its articulated version S* = *It is raining and John knows it* (or some variant, such as *It is raining and John knows that it is raining*). As we will see shortly, if it is taken for granted that it is raining, the first conjunct of S* violates *Be Brief* because it is eliminable: in a context set C in which it is raining, every sentence that starts with *It is raining and blah* is equivalent (relative to C) to *blah* uttered on its own. Since S* is ruled out, S is acceptable in such a context. By contrast, if it is not assumed that it is raining, S* is not ruled out and it is deemed preferable to S.

2.2.   *Derivation of Incremental Transparency*

How should *Be Brief* be stated? Consider the following contrasts:

(15)   a.   Context: Mary has just announced that she is expecting a son. Her husband adds:
              i.   ?<u>She is pregnant and</u> she is very happy.
              ii.   She is very happy.
        b.   Context: Nothing is assumed about Mary.
              i.   #Mary is expecting a son and <u>she is pregnant and</u> she is very happy.
              ii.   Mary is expecting a son and she is very happy.
        c.   Context: Nothing is assumed about Mary.
              i.   #If Mary is expecting a son, <u>she is pregnant and</u> she is very happy.
              ii.   If Mary is expecting a son, she is very happy.

In the infelicitous examples, one can determine as soon as one has heard the string *she is pregnant and* that no matter how the sentence ends, these words could be deleted without affecting its truth-conditional content

relative to the context set. In (15)a, this is because the context set C already guarantees that Mary is pregnant. No matter what the second conjunct γ is, and no matter what the end β of the sentence turns out to be, *(she is pregnant and γ) β* is equivalent in C to $\gamma\ \beta$ (we will sometimes say that the two sentences are 'contextually equivalent' in C). The same analysis applies to (15)b and c, where the sentence starts with an expression that makes *she is pregnant* redundant. In all these cases, then, *she is pregnant* is transparent, i.e. it behaves semantically as if it were not there.

Importantly, however, we must be careful not to make the prohibition against redundant material too stringent. For it is sometimes permissible to include a conjunct that turns out to be dispensable; but this solely happens if this fact can only be ascertained *after* one has heard the end of the conjunction (Horn 1972)[12]. This situation is illustrated in (16)–(17):

(16) a.   <u>Mary is pregnant and</u> she is expecting a son.
      a′. #Mary is expecting a son <u>and she is pregnant</u>.
      b.   If Mary has a big belly, <u>she is pregnant and</u> she is expecting a son.
      b.   #If Mary has a big belly, she is expecting a son <u>and she is pregnant</u>.

(17) a.   <u>John resides in France and</u> he lives in Paris.
      a′. #John lives in Paris <u>and he resides in France</u>.
      b.   If John is in Europe, <u>he resides in France and</u> he lives in Paris.
      b′. #If John is in Europe, he lives in Paris <u>and he resides in France</u>.

In each case, the contextual meaning of the sentence would remain unaffected if we deleted the underlined expressions. But the difference between a–b on the one hand and a′–b′ on the other is that in the former case one *cannot* determine as soon as the underlined expressions have been uttered that they are semantically idle; by contrast, in the latter case the underlined expressions are immediately seen to be redundant.

Taking all these examples into account, we are led to a first version of *Be Brief*, which is *incremental* because it incorporates a linear asymmetry between what comes before and what comes after a presupposition

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12   See Singh 2006 for a discussion of disjunctions in which the linear order also matters.

trigger. Specifically, the beginning of a sentence violates the principle if one of its components is redundant no matter what the end of the sentence turns out to be (this is similar to the constraint of 'local informativity' of other theories, e.g. van der Sandt 1992). To state the principle, we must thus quantify over the 'good finals' of an initial string s, which are all the strings s' that can be added to s to make a syntactically acceptable sentence ss' (for instance, *smokes* is a good final for *John often* because *John often smokes* is a grammatical sentence of English):

(18)   Be Brief – Incremental Version
    Given a context set C, a predicative or propositional occurrence of d is infelicitous in a sentence that begins with α *(d and* if for any expression γ of the same type as d and for any good final β, $C \models \alpha$ (d and γ) $\beta \Leftrightarrow \alpha\gamma\beta$.

    Terminology: If d is infelicitous for this reason, we say that it *incrementally transparent*.

It is worth noting that in this statement α, β, and γ range over *strings of symbols* of a language that includes parentheses to disambiguate structure (equivalently, one could think of α, β, and γ as ranging over *parts of a syntactic tree*, though this would require further elaborations[13]).

Presumably (18) should be derived from a more general principle. We will not attempt such a derivation here. Still, equipped with *Be Articulate* as stated in (13) and (the special version of) *Be Brief* as stated in (18), we can define a fully general projection algorithm: a predicative or propositional occurrence of ... $\underline{d}d'$ ... is acceptable on its own (i.e. without being preceded by the words *d and*) in a certain syntactic environment just in case ... *(d and $\underline{d}d'$)* ... is ruled out because d is incrementally transparent. This derived principle is henceforth called *Incremental Transparency*:

(19)   **Incremental Transparency**
    Given a context set C, a predicative or propositional occurrence of $\underline{d}d'$ is acceptable in a sentence that begins with $\alpha\underline{d}d'$
    if the 'articulated' competitor α*(d and d')* is ruled out because d is transparent,

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[13]   A definition in terms of derivation trees rather than strings was suggested by D. Fox and E. Stabler.

if for any expression γ of the same type as d and for any good final β,

$C \models \alpha \,(d \text{ and } \gamma)\, \beta \Leftrightarrow \alpha\gamma\beta$

(19) accounts for some simple facts of presupposition projection, which parallel the (non-presuppositional) data we observed in (15):

(20)   a. Context: Mary has just announced that she is expecting a son. Her husband adds:

       i.   ?<u>She is pregnant and</u> her parents knows it.

      ii.   Her parents know that she is pregnant.

   b. Context: Nothing is assumed about Mary.

       i.   #Mary is expecting a son and <u>she is pregnant and</u> her parents knows it.

      ii.   Mary is expecting a son and her parents know that she is pregnant.

   c. Context: Nothing is assumed about Mary.

       i.   #If Mary is expecting a son, <u>she is pregnant and</u> her parents know it.

      ii.   If Mary is expecting a son, her parents know that she is pregnant.

In each case, the acceptability of (ii) is a consequence of the unacceptability of (i), which itself derives from the fact that the underlined material is incrementally transparent.

2.3. *Basic examples*

How does the principle of Transparency derive the results of Heim 1983? As we saw in our informal discussion of *John knows that it is raining*, for an unembedded clause *pp* Transparency requires that the context set entail p. The proof is straightforward, but it is worth considering in detail because the argument requires that we pay close attention to the syntax and semantics of our (highly simplified) fragment.

(21) **pp′**

   a. *Transparency* requires that for each clause γ and for each good final β,

     $C \models (p \text{ and } \gamma)\, \beta \Leftrightarrow \gamma\beta$

b.   *Claim:* Transparency is satisfied $\Leftrightarrow C \models p$

c.   *Proof*

$\Rightarrow$: Suppose that *Transparency* is satisfied. In particular, taking β to be the empty string and γ to be some tautology, we get: $C \models (p \text{ and } \gamma) \Leftrightarrow \gamma$, and hence $C \models p$, as desired.

$\Leftarrow$: Suppose that $C \models p$. Since γ is a clause, it is a constituent and so is *(p and γ)*. Since the semantics defined in (12) is extensional[14], *(p and γ)* and γ can be substituted *salva veritate* in C, and thus for each good final β, (p and γ) $\beta \Leftrightarrow \gamma\beta$.

In the case of conjunctions and conditionals (which, following Heim 1983, we treat as material implications), Heim made the following predictions:

–   a conjunction *(pp′ and q)* presupposes *p*.
–   a conjunction *(p and qq′)* presupposes *(if p . q)*
–   a conditional *(if pp′. q)* presupposes *p*.
–   a conditional *(if p . qq′)* presupposes *(if p . q)*

We will now check that the Transparency theory makes the same predictions (in Section 2.4, we state general results that guarantee equivalence with Heim's analysis in almost all cases). The first case, *(pp′ and q)*, is of modest interest: it is clear that if $C \models p$, Transparency is satisfied because for any appropriate γ, *(p and γ)* is contextually equivalent to γ. Conversely, if Transparency is satisfied, it must be the case that *((p and γ) and δ)* is contextually equivalent to *(γ and δ)* no matter what γ and δ are: $C \models ((p \text{ and } \gamma) \text{ and } \delta) \Leftrightarrow (\gamma \text{ and } \delta)$. When γ and δ are both tautologies, we obtain: $C \models p$.

More interesting is the case in which the presupposition trigger occurs in the second conjunct. Here too we derive Heim's result, as shown in (22):

(22)   **(p and qq′)**

a.   *Transparency* requires that for each clause γ and for each good final β,

$C \models (p \text{ and } (q \text{ and } \gamma)) \beta \Leftrightarrow (p \text{ and } \gamma\beta$

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[14]   This is overkill in two respects. First, what is semantically crucial is that the operators do not 'look' at the value of any expression outside of C. Second, in the example at hand β can only be the empty string given the syntax defined in (6).

b.   *Claim:* Transparency is satisfied $\Leftrightarrow$ C $\models$ (if p . q)

c.   *Proof*

$\Rightarrow$: Suppose that Transparency is satisfied. In particular, taking β to be the right parenthesis $)$ and γ to be some tautology, we have:

C $\models$ (p and (q and γ)) $\Leftrightarrow$ (p and γ), hence [because γ is a tautology]

C $\models$ (p and q) $\Leftrightarrow$ p

and in particular

C $\models$ p $\Rightarrow$ q. But since we treat conditionals as material implications, this is just to say that C $\models$ (if p . q).

$\Leftarrow$: Suppose that C $\models$ p $\Rightarrow$ q. Then for each clause γ, C $\models$ (p and (q and γ)) $\Leftrightarrow$ (p and γ), and it also follows that for any good final β':

C $\models$ (p and (q and γ)) β' $\Leftrightarrow$ (p and γ) β'

(since the left-hand side is identical to the right-hand side, except that *(p and γ)* is replaced with a constituent that has the same contextual meaning).

All we must show is that β starts with $)$, and is thus of the form $)$ β'[15]. But since γ and *(q and γ)* are constituents, *(p and (q and γ) β* and *(p and $\gamma\beta$* could only have been formed was by an application of the syntactic rule for *and* in (6); they must thus have the form *(p and (q and γ)) β'* and *(p and γ) β'* respectively.

Let us turn to conditionals. The case of *(if pp' . q)* is similar to *(pp' and q)*. It is clear that if C $\models$ p, Transparency is satisfied because for any appropriate γ, *(p and γ)* is contextually equivalent to γ. Conversely, if Transparency is satisfied, C $\models$ (if (p and γ) . δ) $\Leftrightarrow$ (if γ . δ). Taking δ to be a contradiction and γ to be a tautology, we get C $\models$ (not p) $\Leftrightarrow$ δ, hence the result that C $\models$ p. More interesting is the case in which the presupposition trigger is in the consequent of the conditional. We do derive Heim's result that *(if p . qq')* presupposes *(if p . q)*, as shown in (23):

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[15]   In fact, in this particular example β' can only be the empty string.

(23) **(if p . qq′)**

    a. *Transparency* requires that for each clause γ and each good final β,

        $C \models$ (if p . (q and γ)) $\beta \Leftrightarrow$ (if p . $\gamma\beta$

    b. *Claim:* Transparency is satisfied $\Leftrightarrow C \models p \Rightarrow q$

    c. *Proof*

        $\Rightarrow$: Suppose that Transparency is satisfied. In particular, taking β to be the right parenthesis $)$ and γ to be some tautology, we have

        $C \models$ (if p . (q and γ)) $\Leftrightarrow$ (if p . γ), hence

        $C \models$ (if p . q)

        $\Leftarrow$: Suppose that $C \models$ (if p . q). Then for each clause γ, $C \models$ (if p . (q and γ)) $\Leftrightarrow$ (if p . γ), and for any acceptable β', $C \models$ (if p . (q and γ)) $\beta' \Leftrightarrow$ (if p . γ) β'. For syntactic reasons (the same as in (22)), β must have the form $)$ β', and the result follows.

It should be noted that linear order plays a crucial role in our account – as it did in Stalnaker's analysis. It is thus important that the syntactic rules defined in (6) guarantee that the antecedent of a conditional comes before the main clause. However natural language certainly allows for conditionals of the form $\underline{qq'}$ *if p* (e.g. *John knows that Mary is pregnant, if she is expecting a child*). We predict – possibly incorrectly – that these should presuppose that *q* (since we must ensure that *q* can be determined to be transparent as soon as it is heard). The issue is complex, in part because one could in principle posit that *if p* 'really' appears in an initial position at Logical Form; we revisit this issue in Section 3, where a symmetric version of *Be Brief* is defined, which leads to different predictions.

2.4. *General results*

We just saw that the Transparency theory can match Heim's predictions in some simple examples. But does the equivalence hold in the general case? The answer requires some formal work, which can be found in Schlenker 2007b. Here we simply state the main conclusions.

 (i) In the propositional case, i.e. in the fragment of (6) that does not include any quantifiers, we obtain *full equivalence* between the

Transparency theory and Heim 1983 (supplemented with the treatment of disjunction in Beaver 2001). We write Transp(C, F) if each occurrence of the form $\underline{d}d'$ in the formula F satisfies Transparency (as stated in (19)) with respect to C, and we write $w \models F$ if F is true at w according to the bivalent, non-dynamic semantics.

(24)   **Theorem 1**
       For any formula F of the propositional part of the fragment in (6) and for any $C \subseteq W$:
       (i)   Transp(C, F) iff $C[F] \neq \#$.
       (ii) If $C[F] \neq \#$, $C[F] = \{w \in C: w \models F\}$.

(ii)   In the quantificational case, things are more complicated. The equivalence only holds if two additional conditions are satisfied:
       Constancy: The domain of individuals has constant finite size across C, and each restrictor of a generalized quantifier holds true of a constant number of individuals throughout C.
       Non-Triviality: Whenever a string α *A* is encountered at the beginning of a sentence, where *A* is a quantificational clause (of the form $A = (Q\ G.\ H)$), there should be at least one full sentence α *A* β in which *A* plays a non-trivial semantic role, in the sense that *A* could not be replaced with a tautology *T* or a contradiction *F* without modifying the contextual meaning of the sentence. Thus it should be the case that for at least one good final β, $C \not\models \alpha\ A\ \beta \Leftrightarrow \alpha\ T\ \beta$ and $C \not\models \alpha\ A\ \beta \Leftrightarrow \alpha\ F\ \beta$.

'Constancy' is a technical hypothesis with no good justification; without it, we predict slightly weaker presuppositions than Heim – which might be a good thing for some quantified examples, as is discussed in the Appendix (but as things stand the detail of our predictions cannot be taken to be an advantage over competing theories). On the other hand 'Non-Triviality' is entirely natural. Why would one go out of one's way to utter a sentence α *A* β with a quantificational clause *A* if the same semantic result can be obtained by replacing *A* with a non-quantificational clause, and moreover one which is trivially true or trivially false[16]? When

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[16]   There exists one construction that belies this reasoning, however. *Whether John is competent or not, I won't hire him* contains a clause – John is competent or not – which is tautologous and violates *Non-Triviality*. I leave this as a problem for future research.

these two conditions are satisfied, full equivalence with Heim's results is guaranteed for the fragment defined in (6):

(25) **Theorem 2**
      Let F be any formula of the fragment in (6) and let C ⊆ W. If the domain of individuals is of finite size and if C and F satisfy Constancy and Non-Triviality, then:
      (i)   Transp(C, F) iff C[F] ≠ #.
      (ii) If C[F] ≠ #, C[F] = {w ∈ C: w ⊨ F}.

2.5. *Extensions*

It is worth pausing for a moment to see how the present theory can deal with 'accommodation', and to lay out some further predictions that it makes.

2.5.1. *Accommodation.* Heim 1983 provides not just a theory of presupposition projection in the strict sense, but also a theory of accommodation, designed to account for two kinds of exceptions to her theory (or to anybody else's, for that matter):

(i)   *Global Accommodation* allows an addressee to adapt his beliefs to ensure that the speaker's utterance does not result in presupposition failure. If I tell you that *my sister is pregnant*, no break-down in communication ensues even if you do not initially know that I have a sister. Being the cooperative individual that you are, you kindly revise your initial view of the context set, adding to it the information that I have a sister. The rest of the exchange can then proceed on the basis of this revised context.

(ii) *Local Accommodation* is a far more dubious mechanism. In the dynamic framework, it allows one to tinker with the local context set with respect to which an expression is evaluated, without modifying the initial context set itself. This mechanism is for instance necessary to deal with the (correct) claim that *the king of Moldavia is not powerful because Moldavia is not a monarchy*. Adding to the initial context set the information that Moldavia is a monarchy wouldn't help, as this would make the entire sentence a contextual contradiction (since the end of the sentence asserts that Moldavia is not a

monarchy). On the other hand no problem arises if we solely modify the local context set with respect to which the definite description is evaluated. The sentence ends up meaning something like: *It is not the case that* **Moldavia is a monarchy and** *the king of Moldavia is powerful, because Moldavia is not a monarchy*, where the part in bold results from the local revision that is necessary to satisfy the presupposition of the definite description.

Global Accommodation is conceptually unproblematic; as emphasized in Lewis 1979, it is just what one expects from cooperative speech act participants, who seek to make the conversational exchange as smooth as possible. This mechanism can be imported with minimal change into the Transparency framework: if the addressee initially thinks that the speaker is violating the principles of manner, he may be willing to revise his beliefs – and thus the context set – to guarantee that the speaker does turn out to be 'as articulate as possible' after all. Local Accommodation is conceptually far more problematic, and it is not clear that there is a place for it in Lewis' theory. But its effects can be emulated within the Transparency framework. All we need to say is that, under duress (e.g. to avoid a very bad conversational outcome, such as the utterance of a contradiction or a triviality), one may assume that the speaker did not obey *Be Articulate*. This leaves us with an unadorned bivalent meaning, and *the king of Moldavia is not powerful* (read with wide scope negation) is simply understood as *it is not the case that Moldavia has exactly one king, and that he is powerful*. In the case of a definite description, we recover in this way the old Russellian truth conditions. But the point is more general: *John doesn't know that he has cancer because he isn't even sick!* is (more or less) acceptable to convey that *it is not the case that John has cancer and that he believes that he has cancer*. Like Local Accommodation, the non-application of Transparency must be constrained: Heim takes Local Accommodation to be a 'last resort', and we could take the same stance about our homologous device (see below for discussion). It seems, then, that both of Heim's accommodation mechanisms can be imitated in the Transparency framework[17].

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[17]   See Kadmon 2001, Chapters 9–10, for a textbook presentation of some problems raised by accommodation.

It should be added that a third kind of accommodation, 'intermediate accommodation', has been vigorously defended in van der Sandt 1992 and Geurts 1999, and no less vigorously attacked in Beaver 2001. The debate is too complex to go into here, but for better or worse the simplest version of the present theory sides with Beaver in denying that intermediate accommodation is possible. An investigation of this issue is left for future research.

2.5.2.　*Further predictions*

❑　*Unless*

The strength of the Transparency theory is that it is predictive: once the syntax and the classical truth-conditional content of an operator have been fixed, its projective behavior is fully determined. In particular, the Transparency theory derives a prediction which, to my knowledge, is not matched by any existing dynamic framework: *if two expressions have the same truth-conditional contribution and the same syntax, they have the same projective behavior.*

This solves the problem that Heim's theory faced with the connective *unless*. From the observation that the classical meaning of *unless G, H* is (more or less) synonymous with that of *if not G, H*, it did *not* follow for Heim 1983 that these expressions must have the same dynamic behavior. But things are different in the Transparency framework: *if not* and *unless* share the same truth-conditional behavior and have almost the same syntax, and thus they must have the same projective behavior as well[18]. In particular, the intuitive equivalence between *Unless John didn't come, F* and *Unless John didn't come, John came and F* ensures that the correct projection results are obtained for the sentence *Unless John didn't come, Mary will know that he is here*: if C $\models$ (if John came, John is here), we also have that for every good final β, C $\models$ (Unless

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[18]　The prediction would be straightforward if *unless* and *if not* had *exactly* the same syntax. But given our bracketing conventions, this is not quite so: on the assumption that *unless* has the same syntactic behavior as *if*, we must compare *(if (not F), G)* with *(unless F, G)*. The prediction that both structures should have the same presuppositional behavior can be derived with a bit of formal work.

John didn't come, (John is here and F) β ⇔ (Unless John didn't come, F) β. But this shows that Transparency is satisfied.

❏   *Attitude Reports*

Attitude reports present interesting difficulties for any theory of presupposition projection. Before we come to the hard cases, let us start with two standard examples:

(26)   a.   John thinks that Mary is competent, and he believes Peter to know that she is.
       b.   John believes Peter to know that Mary is competent.

Intuitively, (26)a presupposes nothing. This certainly follows from the Transparency theory: the articulated version of the second conjunct is *he believes that* Mary is competent and *that Peter knows that she is*, but due to the first conjunct *John thinks that Mary is competent*, the underlined material is transparent. In fact, if *John believes that F* is analyzed as *every world compatible with John's beliefs satisfies F* (as is standard in possible worlds semantics), it should also follow from (an extension of) Theorem 2 that *John believes that pp′* presupposes, in essence, that *every world compatible with John's beliefs satisfies p*, i.e. that *John believes that p*[19]. We note that (26)b tends to presuppose that *Mary is competent and John believes it*, which is slightly stronger than either Heim 1983 or the Transparency theory would predict (the expected presupposition is just that *John believes that Mary is incompetent*). This is an instance of the so-called 'proviso problem', to which we return in the Appendix.

   The truly difficult examples, however, involve other propositional attitudes. We illustrate the problem with verbs of desire:

(27)   a.   John would like Mary to be incompetent and he would like Peter to know that she is.
       b.   John thinks that Mary is incompetent and he would like Peter to know that she is.

Intuitively, (27)a–b presuppose nothing. This is expected in the case of (27)a; the point is straightforward if *John would like F* is analyzed as: every world compatible with John's desires satisfies *F*. More theory-

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[19]   An extension of the Theorem is necessary because we did not include in our 'official' language any quantifiers over possible worlds.

neutrally, the result simply follows from the observation that in *John would like Mary to be incompetent, and he would like <u>Mary to be incompetent and</u> Peter to know that she is* the underlined material is transparent. When it comes to (27)b, however, things are more difficult. A quantificational analysis is at a loss to explain why the sentence presupposes nothing. Be it for Heim 1983 or for the Transparency theory, the expectation is that the second conjunct should presuppose that John would like Mary to be incompetent. But from the first conjunct it only follows that John *believes* that Mary is incompetent, not that he *wants* her to be. Heim 1992 had to revise the semantics of verbs like *want* and *wish* to derive the correct result. We believe that this move was correct. But the advantage of the Transparency theory is that it allows us to make predictions *without* having a fully specified lexical semantics for these verbs. It suffices to consider the articulated competitor of (27)b, and to ask whether there is independent evidence that the relevant portion of the sentence is transparent:

(28) a.   #John thinks that Mary is incompetent, and <u>he would like her to be (incompetent) and</u> . . .
      b.   John thinks that Mary is incompetent, and Peter would like her to be.

Without even knowing what the end of (28)a is, we can determine that the sentence is deviant – more specifically that it sounds redundant. This is in sharp contrast with (28)b, which is quite acceptable. Even without having an *analysis* of the semantics of *would like to*, this suffices to derive our projection data from non-presuppositional facts.

3.   Symmetric Transparency

3.1.   *Symmetric readings*

❏   *The problem*
In its current state, our analysis predicts that binary connectives should be *projectively asymmetric*: since linear order plays a crucial role in the computation of Incremental Transparency, even connectives that are semantically symmetric need not project presuppositions in the same way from their two arguments. This is in particular the case of conjunction

and disjunction: *(p and qq′)* presupposes that *(if p . q)*, but *(qq′ and p)* presupposes that *q*; similarly, *(p or qq′)* presupposes that *(if (not p), q)*, but *(qq′ or p)* presupposes that *q*. For conjunction, this result is generally taken to be entirely correct (we will soon add some qualifications). For disjunction, by contrast, there is no consensus. Heim 1983 does not discuss *or*. Beaver 2001 argues for the asymmetric lexical entry in (29), which was part of the dynamic semantics we defined in (7). But his conclusion seems to be motivated in part by a desire to preserve the equivalence between *(G or H)* and *not ((not G) and (not H))*. However, the fact that the equivalence holds in classical logic does not imply that it must hold in dynamic logic, for the familiar reason that the latter is strictly more expressive than the former.

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

In his presentation of Heim's dynamic semantics, by contrast, Geurts 1999 defines a lexical entry that predicts that a disjunction should inherit the presuppositions of each of its component parts (see also Krahmer 1998 for discussion):

(30)   C[(G or H)] = # iff C[G] = # or C[H] = #. If ≠ #, C[(G or H)] = C[G] ∪ C[H]

In its present state, the Transparency theory falls squarely on Beaver's side of the debate, which predicts an asymmetry. But the data do not bear this out:

(31)   a.   This house has no bathroom or (else) the bathroom is well hidden (after Partee)
       b.   The bathroom is well hidden or (else) this house has no bathroom.

Although (31)a is predicted Beaver's entry, (31)b is not. As for Geurts's entry, on superficial inspection its expectations are incorrect in all cases, since it predicts that the presuppositions of either disjunct should be inherited by the entire sentence (local accommodation is then needed to derive the correct data).

From the perspective of dynamic semantics, one could think that the problem is to define the 'right' lexical entry for disjunction (alternatively,

we could analyze *else* as *if not* and explain the data in terms of this covert conditional). But the point is more general. Trading on the (near) equivalence between *if G, H* and *if not H, not G*, we can replicate the problem with conditionals[20]; in fact, due to the (near) equivalence *not G or H* and *if G, H*, we can give examples that are only minimally different from those in (31):

(32) a. If this house has a bathroom, the bathroom is well hidden.
  b. If the bathroom is not hidden, this house has no bathroom.

It is worth noting for completeness that the position of the *if*-clause does not appear to affect the judgments:

(33) a. The bathroom is well hidden, if this house has a bathroom.
  b. Mary's doctor knows that she is expecting a child, if she is
   pregnant.

In all cases, then, the facts are roughly the same: each sentence can be read without presupposition, though this is easier in the 'canonical' than in the 'reversed' order (with the possible exception of post-posed *if*-clauses, which behave very much like pre-posed ones[21]). It would be misguided to seek a lexical solution to this problem, since it would have to make a stipulation about disjunction, and another one about conditionals, etc. A general treatment is called for.

❏ *A solution based on local accommodation*
From the perspective of Heim's account or of the Transparency theory, which make almost the same predictions[22], it is tempting to appeal to

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[20] This is only a 'near' equivalence because of the notorious 'non-monotonicity' of conditionals. But as noted in Stalnaker 1975, in the case of indicative conditionals something like a monotonic behavior is in fact obtained. In any event, all we need is that in the case at hand *if G, H* is indeed contextually equivalent to *if not H, not G*. And this appears to be the case.
[21] As suggested by E. Herburger (p.c.), this could indicate that a post-posed *if*-clause must reconstruct to a pre-posed position before it is interpreted. This is a direction worth investigating, but it appears to go against the syntactic evidence adduced by Bhatt and Pancheva 2006. One could also take these facts (if they are real) to argue against the present theory's reliance on linear order.
[22] The exception, which might go in Heim's favor, concerns *if*-clauses (see the preceding footnote). Since her theory does not rely on linear order, the pre-posed or post-posed nature of an *if*-clause should not make any difference to its interpretation.

local accommodation. As noted earlier, this mechanism was taken by Heim (following the spirit of Gazdar 1979) to be applicable whenever this was the only way of preventing a sentence from being trivially true or trivially false. Now consider the case of disjunction. A standard Gricean constraint is that if one asserts *(G or H)*, both *G* and *H* should be open possibilities. But if it is presupposed in (31) that the house has a bathroom, one of the disjuncts is trivially false. To avoid this undesirable outcome, local accommodation must be applied. As a result, (31)b is understood as *Either there is a bathroom and it is well hidden or else this house has no bathroom*. This line of analysis saves Heim 1983 (and the Transparency theory) from the apparent counter-example in (31)b; but it can also be used to save Geurts's entry from the counter-examples in (31)a and b. In addition, the same logic can be applied to sentences involving conditionals: *if F, this house has no bathroom* is only felicitous if there is a possibility that the house has no bathroom, which should force local accommodation for *F = the bathroom is not hidden*. This view of local accommodation can be adapted to the Transparency framework: all we need to say is that one may fail to apply Transparency (or to put it differently: one may incur a violation of *Be Articulate*) if this is the only way of making a sentence non-trivial.

As pointed out by B. Spector (p.c.), some evidence in favor of an asymmetric behavior of disjunction can be found if one picks as the first disjunct an element whose negation is *stronger* than the presupposition of the second disjunct:

(34) a. Mary doesn't have a violin, or else her instrument is well hidden.
      b. Mary's instrument is well hidden, or else she doesn't have a violin.
      a′. Mary doesn't have cancer, or else her doctor will realize that she is sick.
      b′. Mary's doctor will realize that she is sick, or else she doesn't have cancer.

In these cases, local accommodation is not forced because when one presupposes that Mary has an instrument, there may still be a possibility that she does or does not have a violin; thus the Gricean constraint on disjunctions is not violated. Similarly, in (34)b′ one may presuppose that Mary

is sick without making either disjunct semantically idle. As a result, the asymmetric account predicts that (34)a–a′ presuppose nothing, and that (34)b–b′ respectively presuppose that Mary has an instrument and that she is sick.

My impression of the data is as follows:

(i)   There is a stronger tendency for the b–b′ examples to be presuppositional in (34) than in (33). Furthermore, (34) displays contrasts between the a–a′ and the b–b′ examples.

(ii) However, the data are not as sharp as a fully asymmetric account would lead one to expect[23].

As far as I can tell, the data are essentially the same in conditionals, when *if F, G* is compared to its contraposition *if not G, not F*: when the presupposition trigger is in the consequent, no presupposition is inherited by the entire clause; but when the trigger is in the antecedent, a non-presuppositional reading is harder to obtain:

(35)   a.   If Mary has a violin, her instrument is well hidden.
       b.   If Mary's instrument is not hidden, she doesn't have a violin.
       a′. If Mary had cancer, her doctor knews that she was sick.
       b′. If Mary's doctor didn't know that she is sick, she didn't have cancer.

❏   *The need for an alternative*

Despite its appeal, the analysis based on local accommodation might not be enough to account for the data. First, I don't find it entirely impossible to understand the examples in (34)b–b′ without a presupposition. Second, the account depends on a questionable assumption about local accommodation, namely that *local accommodation is felt as 'natural' (= non-deviant) if this is what it takes to save the sentence from triviality*[24]. But in other cases, this assumption appears to me be incorrect; to my ear the following examples are rather deviant:

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[23] I believe that the data partly hinge on intonation, but I leave this issue for future research.

[24] See also Kadmon 2001, Chapters 9–10 for relevant discussion.

(36) a.   ?Mary isn't sick, and she doesn't know that she has cancer.
      b.   ?Mary doesn't know that she has cancer, and she isn't (even) sick.
      a′. ?John doesn't have an instrument, and his violin isn't hidden.
      b′. ?John's violin isn't hidden, and he doesn't (even) have an instrument

In each case, the sentence is contradictory if local accommodation is not applied. This should suffice to make local accommodation freely available, but if so the sentences should be fully acceptable. In fairness, the examples in (36)a–a′ could be dismissed because when local accommodation is applied the second conjunct turns out to add nothing to the first one – e.g. as soon as one has heard *Mary isn't sick*, one can infer that *it's not the case that (she has cancer and she knows it)*. But this line of explanation won't do for (36)b–b′: from *it's not the case that (Mary has cancer and she knows it)*, it doesn't follow that Mary isn't sick, and thus the second conjunct makes a non-trivial contribution[25]. Still, the sentence is, to my ear at least, somewhat deviant. This suggests that local accommodation is generally costly. But if so, local accommodation by itself cannot account for the symmetric examples in (31)b–b′, which are considerably less deviant than those in (36).

Pending further investigation, I conclude that (i) as a first approximation, the connectives display the asymmetric behavior predicted by Heim 1983, Beaver 2001 and our existing version of Transparency; however, (ii) with some difficulty, a symmetric behavior can be obtained, and it is not wholly reducible to local accommodation. (A further argument in favor of (ii) is discussed in Section 3.3).

3.2. *Derivation of Symmetric Transparency*

To address the problem of symmetric readings, we posit a symmetric version of the principle of Transparency. Just like the incremental principle

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[25]   In fact, when local accommodation is applied, the examples in (36)b–b′ have the same structure as (i), which is fully acceptable when *even* is included:

(i) a.   John doesn't live in New York, and he doesn't even reside in the US.
     b.   John doesn't have a Stradivarius and he doesn't even have an instrument.

was derived from the interaction of an incremental version of *Be Brief* with *Be Articulate*, so similarly we obtain the new version of Transparency by first stating a symmetric version of *Be Brief*:

(37)   Be Brief – Symmetric Version
   Given a context set C, a predicative or propositional occurrence of *d* is (somewhat) infelicitous in a sentence of the form α *(d and d′) β* if for any expression γ of the same type as *d*, C $\models$ α (d and γ) β $\Leftrightarrow$ $\alpha\gamma\beta$.

   Terminology: If *d* is infelicitous for this reason, we say that it *symmetrically transparent*.

Our initial version of *Be Brief* was *incremental* because it required that Transparency be satisfied by any initial string of a sentence. The new version is *symmetric* because it takes into account the entire sentence that was uttered. Importantly, the second conjunct γ is still universally quantified; in other words, a conjunction α *(d and d′) β* is only ruled out by the new principle in case *d and* is certain to be semantically eliminable *no matter what the second conjunct is*. We could have stated a stronger principle that blocked α *(d and d′) β* whenever it is contextually equivalent to α *d′ β*, but as we saw in (16)–(17), this would be far too strong: there are fully acceptable examples in which the second conjunct entails the first one. As stated, the symmetric version of *Be Brief* is admittedly harder to motivate in terms of a processing metaphor than its incremental counterpart: if one has heard the end of the sentence *β, a fortiori* one has heard the second conjunct *d′*, and thus it is a bit mysterious why the latter should not be taken into account in the new version of *Be Brief*. Be that as it may, there is some evidence that α *(d and e) β* is ruled out in *non*-presuppositional examples whenever *d* is symmetrically transparent. The facts are clearest with post-posted *if*-clauses:

(38)   a.   ??Mary is pregnant and (she is) happy, if she is pregnant.
   b.   ??Mary is pregnant and (she is) happy, if she is expecting a child.
   c.   ??Mary is pregnant and (she is) happy, if she is expecting a boy.

Trading on the (near) equivalence between *if F, G, if not G, not F* and *unless G, not F*, we can also test cases that don't involve a post-posed *if*-clause:

(39) a. ?If Mary is not (both) pregnant and happy, she is not pregnant.
      b. ?If Mary is not (both) pregnant and happy, she is not expecting a child.
      c. ?If Mary is not (both) pregnant and happy, she is not expecting a boy.

(40) a. ?Unless Mary is pregnant and (she is) happy, she is not pregnant.
      b. ?Unless Mary is pregnant and (she is) happy, she is not expecting a child.
      c. ?Unless Mary is pregnant and (she is) happy, she is not expecting a boy.

My impression is that the examples in (39)–(40) are slightly more acceptable than those in (38), which might be due to the fact that a somewhat more complex reasoning is necessary to determine that the first conjunct is semantically eliminable once the entire sentence has been heard. More importantly, this observation might be correlated with the fact, noted earlier, that post-posed *if*-clauses behave very much like pre-posed ones with respect to presupposition projection, whereas examples based on the near-equivalence between *if F, G* and *if not G, not F* do give rise to some differences.

The interaction of the symmetric version of *Be Brief* with the old version of *Be Articulate* derives a new, symmetric version of the principle of Transparency. To the extent that violations of the symmetric version of *Be Brief* lead to a *weaker* deviance than violations of the incremental version, we might expect that a presuppositional sentence that fails to be articulate because its competitor is so ruled out is itself only 'somewhat' acceptable:

(41) **Symmetric Transparency**
      Given a context cet C, a predicative or propositional occurrence of $\underline{d}d'$ is (somewhat) acceptable in a sentence of the form $\alpha\ \underline{d}d'\ \beta$
      if the 'articulated' competitor $\alpha\ (d\ and\ d')\ \beta$ is ruled out because d is symmetrically transparent,
      if for any expression γ of the same type as d,
      $C \models \alpha\ (d\ and\ \gamma)\ \beta \Leftrightarrow \alpha\gamma\beta$

Let us illustrate this principle with some of the symmetric examples we discussed earlier. We observed that *(pp′ or q)* can be taken to presuppose nothing if *not q* entails *p*. Here is how this follows:

(42)   a.   Symmetric Transparency:
             for every clause γ, C $\models$ ((p and γ) or q) $\Leftrightarrow$ (γ or q)
       b.   *Claim*: (a) is satisfied if and only if C $\models$ (if not q, p)
       c.   *Proof*: (i) If C $\models$ (if not q, p), it is immediate that (a) is satisfied. (ii) If (a) is satisfied, by taking γ to be some tautology, we obtain C $\models$ ((p and γ) or q), and hence C $\models$ (p or q), i.e. C $\models$ (if not p, q)

Since linear order plays no role in the statement of Symmetric Transparency, it is immediate that we make the same predictions for *(pp′ or q)* and for *(q or pp′)*. In addition, if conditionals are taken to satisfy the rule of contraposition, we also predict that *(if not q, pp′)* and *(if not pp′, q)* should display the same projective behavior.

3.3.   *Conjunction revisited*

If Symmetric Transparency is correct, we expect that some sentences of the form *(pp′ and q)* may be understood without a presupposition in case *q* entails *p*. This prediction flies in the face of some of the strongest data in presupposition theory, which concern the asymmetry between, say, *Moldavia is a monarchy and its king is powerful* vs. *Moldavia's king is powerful and it is a monarchy*. But on closer inspection the latter sentence is ruled out on independent grounds: once one has heard *Moldavia's king is powerful*, one can infer that Moldavia is a monarchy, and for this reason the second conjunct is semantically idle. Such configurations are presumably ruled out by the incremental form of *Be Brief* [26], a conclusion which is also suggested by non-presuppositional examples:

(43)   #John is staying near the Louvre and he is in Paris.

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[26]   They are not ruled out by the highly specialized versions of *Be Brief* which were stated above. The latter only ruled out some conjunctions on the basis of the their *first* component part; by contrast, in the case at hand something is wrong with the *second* conjunct.

To test our prediction, then, we must consider examples in which the second conjunct entails the presupposition of the first one, but in which the (bivalent meaning of the) first conjunct does *not* entail the second conjunct. Geurts 1999 discusses examples of this type involving anaphora[27]. Here are some presuppositional examples (some sentences in (44) are structurally ambiguous, but those in (45) are not[28]):

(44) a. [John knows that he is sick] and he has cancer!
      b. [John doesn't know that he sick] and he has had pancreas cancer for five years!
      c. I really doubt [that [John doesn't know he is sick] and that he has had pancreas cancer for five years] – one doesn't survive for that long with such a disease.
      d. Is it true that [John knows he is sick] and that he has cancer?
      e. Is it true that [John doesn't know he is sick] and that he has cancer?

(45) a. John has stopped smoking and he used to smoke five packs a day!
      b. John hasn't stopped smoking and he used to smoke five packs a day!
      c. I really doubt that John has stopped smoking and (that he) used to smoke five packs a day – one doesn't get off easily when one has been that addicted.
      d. Is it true that John has stopped smoking and (that he) used to smoke five packs a day?
      e. Is it true that John hasn't stopped smoking and (that he) used to smoke five packs a day?

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[27] See Geurts 1999 pp. 123–127 (example (6)):

   (i) a. I don't know what he has on them, but it seems that one of the pupils is blackmailing some of the teachers.
        b. I don't know what they have on them, but it seems that most of the pupils are blackmailing at least one of the teachers.

[28] Thanks to the participants to the Fall 2007 seminar on presupposition at UCLA for help with these examples.

With respect to all of these cases, it seems to me that it is *to some extent* possible to understand the sentences with no presupposition at all, but that such a reading is very difficult; if correct, both sides of the observation should be derived. The crucial examples involve negations and questions, which are classic presupposition tests (in positive examples it is extremely difficult to tease apart the presupposition from the assertive component). Thus some speakers can read (44)c–d and (45)c–d without a presupposition that John is indeed sick or that he used to smoke. And it can be established that the second conjunct is indeed responsible for this possibility: when it is replaced with a clause that does not entail the presupposition of the first conjunct, the facts change:

(46) a. I really doubt that [John doesn't know he is sick] and that he is going to stay in his current position.
      b. Is it true that [John doesn't know that he is sick] and that he is going to stay in his current position?

In each case there is, to my ear, a strong implication that John really is sick – which is in sharp contrast with the data we saw in (44)[29].

Importantly, an orthodox view of presupposition projection, coupled with the Gazdar / Heim view of local accommodation, predicts that projection should be obligatory in (44). This is because no triviality of any sort is obtained when a presupposition is computed in the first conjunct: it certainly makes sense to presuppose that John is sick, to assert that he knows (or doesn't know) it, and to then add that he has

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[29] One could venture that the data in (44)–(45) are due to local accommodation, and that for unknown reasons local accommodation makes less pragmatic sense in (46). But this does not seem to be the case, since analogous examples with a full conjunction are not pragmatically deviant:

(i) a. I really doubt that John is sick, doesn't know it, and is going to stay in his current position.
     b. Is it true that John is sick, doesn't know it, and is going to stay in his current position?

cancer. Still, a non-presuppositional reading is to some extent available. We take this to be an important argument in favor of Symmetric Transparency.

3.4.   *How many principles?*

Our theory now suffers from an embarrassment of plenty. We have tentatively argued that Incremental Transparency is not enough, even when supplemented with local accommodation. On the other hand it is immediate that Symmetric Transparency is strictly more liberal than the incremental version of the principle (because it takes into account more information about the sentence when determining whether a presupposition is 'redundant', and thus acceptable). There are three possibilities:

 (i) We may stick to the incremental version of the principle, and seek to explain away the symmetric readings by refining the account (possibly by developing a more fine-grained view of local accommodation)

 (ii) We may adopt the symmetric principle alone. This yields a very liberal view of projection, which does not account for the difference in acceptability between, say, *(p and qq′)* and *(qq′ and p)* (in case *p* contextually entails *q*). It seems to be a relatively clear fact that the 'canonical' order is preferred to the 'reversed' order.

(iii) One last solution, which has our preference, is to adopt both the incremental and the symmetric version of the principle, but to assign different strengths to them. The idea is that a sentence is less sharply excluded when it violates the symmetric version of *Be Brief* alone than when it violates both the symmetric and the incremental version. In addition, the acceptability of a sentence α $\underline{d}d′$ β is inversely correlated with the acceptability of its 'articulated' competitor α *(d and $\underline{d}d′$)* β: the more acceptable the latter, the less acceptable the former. As a result, when α *(d and $\underline{d}d′$)* β is weakly ruled out by the symmetric version of *Be Brief*, α $\underline{d}d′$ β is only weakly acceptable; by contrast, when α *(d and $\underline{d}d′$)* β is

strongly ruled out by the incremental version of *Be Brief*, α d̲d̲′ β is fully acceptable.

Although local accommodation alone may not quite suffice to explain away the symmetric examples we discussed in this section, it remains true that, all things being equal, it should be easier to understand *(qq′ or p)* without a presupposition when *p* is equivalent to *q* than when it asymmetrically entails it. This is so for precisely the reason we discussed above: in the first case it just makes no sense to presuppose *q*, which makes it easy for the addressee to understand that this couldn't be what the speaker intended; in the latter case, by contrast, it makes sense to presuppose *q*, and this is what the incremental principle requires. It is only when the symmetric principle is applied that the sentence can be understood with no presupposition. But we just noted that the second principle leads to decreased acceptability. It is only natural, then, that one tends to assume in these cases that *q* is presupposed. This accounts for the contrasts we discussed in (34).

3.5.   *Examples*

For the sake of illustration, we provide below an analysis of a few simple examples, on the assumption that the system is 'basically' optimality-theoretic, except that (i) *Be Brief* leads to greater deviance when its incremental version is violated than when only its symmetric version is, and (ii) the acceptability of a sentence is inversely correlated to that of its competitor. We write *Ok?* for a somewhat acceptable sentence, and **?* for a somewhat deviant one).

Example 1 C ⊭ John used to smoke	**Be Brief- Incremental**	**Be Brief- Symmetric**	**Be Articulate**	**Status**
John has stopped smoking.	Ok	Ok	*	*
John used to smoke and he has stopped smoking.	Ok	Ok	Ok	Ok

Example 2 C $\not\models$ John used to smoke	Be Brief- Incremental	Be Brief- Symmetric	Be Articulate	Status
John used to smoke 5 packs a day and he has stopped smoking.	Ok	Ok	*	Ok
John used to smoke 5 packs a day and [he used to smoke and he has stopped smoking].	*	*	Ok	*

Example 3 C $\not\models$ John used to smoke	Be Brief- Incremental	Be Brief- Symmetric	Be Articulate	Status
John has stopped smoking and he used to smoke 5 packs a day.	Ok	Ok	*	Ok?
[John used to smoke and he has stopped smoking] and he used to smoke 5 packs a day.	Ok	*	Ok	*?

Example 4 C $\not\models$ John used to smoke	Be Brief- Incremental	Be Brief- Symmetric	Be Articulate	Status
If John used to smoke 5 packs a day, he has stopped smoking.	Ok	Ok	*	Ok
If John used to smoke 5 packs a day, he used to smoke and he has stopped smoking.	*	*	Ok	*

Example 5 C ⊭ John used to smoke	Be Brief- Incremental	Be Brief- Symmetric	Be Articulate	Status
John has stopped smoking, if he used to smoke 5 packs a day.	Ok	Ok	*	Ok?
John used to smoke and he has stopped smoking, if he used to smoke.	Ok	*	Ok	*?

4.   Conclusion

Much excitement has been generated in the last 25 years by the 'dynamic turn' in semantics. But part of the hype might have been misplaced. On a conceptual level, dynamic semantics appears to be based on a confusion between the assertion of a complex sentence and the complex interaction between several assertions. On a descriptive level, the dynamic framework was successful for the very reason that made its analyses insufficiently explanatory – the additional power afforded by Context Change Potentials made it possible to encode the projective behavior of an operator in its lexical entry, but it made it difficult to explain why certain types of projective behaviors are instantiated while others are not. I certainly do not wish to suggest that the problem is insuperable, and I believe that the dynamic program remains an exciting one; but to be fulfilled it must address both the conceptual question and the explanatory problem. In the meantime, I hope to have shown that a much leaner semantics can account for rather subtle data when it is combined with a simple pragmatic principle, *Be Articulate*, and that this leads to fully explicit predictions in a broad range of cases: Incremental Transparency derives most of Heim's predictions; and when Symmetric Transparency is considered, we obtain a more fine-grained theory which may account for graded judgments. Since the entire theory hinges on the interaction between two Gricean maxims of manner, *Be Articulate* and *Be Brief*, the present analysis might with some justification be called *a pragmatic theory of presupposition projection*.

Appendix. Extensions and problems

In this Appendix, we discuss possible extensions of the analysis and list some open problems.

A.   Assertive Transparency

In the main text, we have been concerned with cases in which a sentence of the form α $\underline{d}d'$ β is acceptable because its articulated competitor α *(d and $\underline{d}d'$)* β is ruled out by a violation of *Be Brief* triggered by the first conjunct *d*. In this paragraph, we briefly consider the possibility that the full conjunction may also be ruled out because the second conjunct is 'semantically idle', in the sense that it makes a contribution which is too modest once the first conjunct has been heard.

   Consider the examples in (47):

(47)   a.   The king of Moldova exists.
       b.   #?Moldova has a king and the king of Moldova exists.
       c.   The king of Moldova doesn't exist.
       d.   #?It's not the case that Moldova has a king and that the king of Moldova exists.

It is clear that (47)a does not presuppose that there exists a king of Moldova, but rather *asserts* it; and similarly (47)c denies that there exists a king of Moldova – and therefore it certainly does not presuppose that there is one.

   There are several ways in which one could account for the data. But the spirit of the present theory suggests that the sentences in (47)a–c are non-presuppositional because their articulated competitors (47)b–d are independently ruled out – which indeed appears to be the case. But *why* are the latter deviant? *Be Brief* as we stated it, whether in its incremental or in its symmetric version, is not violated: in the general case, there is no way to ensure that for any γ the first conjunct is semantically idle in the environment __ *(Moldova has a king and* γ*)* __. On closer inspection, however, it can be seen that the problem lies with the second conjunct: in any environment, once one has heard __ *(Moldova has a king*, the second conjunct *and the king of Moldova exists)* makes no additional

semantic contribution. To avoid unnecessary prolixity, one should thus refrain from pronouncing the second conjunct. This explains why the sentences in (47)b–d are unacceptable; which, in turn, derives the acceptability of (47)a–c.

B.   Quantified sentences

Heim 1983 predicted that all quantifiers give rise to universal projection. More precisely, she predicted that $[Q\underline{P}P']R$ presupposes that every individual in the domain satisfies P (= universal projection from the restrictor) and that $[QP]\underline{R}R'$ presupposes that every *P-individual is an R-individual* (= universal projection from the nuclear scope). These predictions are shared by the present theory when the technical conditions of Theorem 2 are satisfied (these entail in particular that each restrictor is true of a constant number of individuals throughout the context set).

   Chemla 2008a shows with experimental means that robust universal presuppositions are obtained out of the scope of quantifiers such as *every student* and *no student* (e.g. *None of these 10 students takes care of his computer* gives rise to an inference that *each of these 10 students has a computer*). However numerical quantifiers such as *at least 3, less than 3 and exactly 3* do not give rise to the same pattern: Chemla's subjects are roughly at chance with respect to universal inferences. It might be tempting to argue that this is a *good* thing for the present theory because in the case of *every student* and *no student* no additional assumptions are needed to predict universal projection, whereas for (some) numerical quantifiers the technical conditions of Theorem 2 are crucially needed. Unfortunately, these technical conditions happen to be satisfied in the scenarios used Chemla's experiment, which makes it difficult to argue that this is where the source of the difference between quantifiers lies.

   Although Chemla's data do not show any clear contrasts between *at least three* and *at most three*, introspective judgments (which remain to be confirmed) suggest that for some triggers the monotonicity of the quantifier affects the pattern of projection: universal inferences appear to be more easily obtained from the scope of negative than from the scope of non-negative quantifiers, as is suggested by (48) (we only report

contrastive judgments; Chemla's data show that even in (48)b the universal inference is by no means robust).

(48) a. More than 5 of these 10 students realize that they are going to end up unemployed.
         $\not\Rightarrow$ Each of these 10 students is going to be unemployed
      b. Less than 5 of these 10 students realize that they are going to end up unemployed.
         $\Rightarrow$ Each of these 10 students is going to be unemployed
      c. Most of these 10 students realize that they are going to end up unmployed.
         ? $\not\Rightarrow$ Each of these 10 students is going to be unemployed
      d. Exactly 5 of these 10 students realize that they are going to end up unemployed.
         ? $\Rightarrow$ Each of these 10 students is going to be unemployed

If confirmed, the role of monotonicity in presupposition projection will have to be explained in future research.

When we come to relative clauses which restrict quantifiers, it appears that much weaker patterns of projection are obtained than is predicted by current theories. The difference between the scope and the restrictor positions can be illustrated by the following contrast:

(49) Among these 10 students . . .
      a. nobody who applied is aware that he is incompetent.
         $\Rightarrow$ each of the students who applied is incompetent.
      b. nobody who is aware that he is incompetent applied.
         $\not\Rightarrow$ each of the students is incompetent
         $\not\Rightarrow$ each of the students who applied is incompetent.

There is no clear universal inference in (49)b, whereas one is clearly obtained in (49)a. This pattern is confirmed when one considers the restrictor of other quantifiers:

(50) *Context*: We are discussing what happened to the students of the Department during the last job search. I say:
      Among these 10 students . . .
      a. everyone who is aware / unaware that he is incompetent applied.

    b.   nobody / no one who is aware / unaware that he is incompetent applied.

    c.   more than 3 individuals who are aware / unaware that they are incompetent applied.

    d.   less than 3 individuals who are aware / unaware that they are incompetent applied.

    e.   most of those who are aware / unaware that they are incompetent applied.

    f.   exactly 3 individuals who are aware / unaware that they are incompetent applied.

It is too early to tell whether all presupposition triggers behave on a par[30]. But in any event these facts are a challenge for most existing theories. It is of great theoretical importance to determine what is the source of the difference between (49)a and (49)b. One possibility is that there is an asymmetry between nuclear scopes and restrictors *per se*. Another possibility, however, is that relative clauses are the source of the problem. I leave this question for future research.

C.   Indefinites

Heim 1983 noted that indefinites do not give rise to universal presuppositions: *A fat man was pushing his bicycle* does not presuppose that *every fat man had a bicycle*. Admittedly, this example needs to be further controlled to make sure that domain restriction is not the culprit:

(51) a.   3 of these 10 students are unaware that they are going to be without a job next year.

       b.   More than 3 of these 10 students are unaware that they are going to be without a job next year.

Although the data are subtle, I believe that Heim's observation remains correct: (51)a need not give rise to the inference that *all 10 students are going to be without a job*; by contrast, this inference is rather natural in (51)b.

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[30] My impression is that more robust patterns of universal projection can be obtained with other triggers.

We will suggest that the projective behavior of indefinites should be correlated with another property that distinguishes them from other quantifiers: their ability to take scope out of syntactic islands, as is illustrated in (52).

(52)   a.   Whenever I invite 2 of these 10 students, a disaster ensues.
             possible 'wide scope' reading: 2 of these 10 students are such that, whenever I invite them, a disaster ensues
       b.   Whenever I invite more than 2 of these 10 students, a disaster ensues.
             no 'wide scope' reading

The problem of 'island-escaping' readings has given rise to several lines of analysis in the literature. A common one is the Choice / Skolem function approach, which gives indefinites a higher-order semantics (see for instance Schlenker 2006a for a recent summary). Another line is the 'singleton indefinite' approach, which claims that unmodified indefinites may have a domain restriction – possibly one that comes *in addition* to the implicit restriction that any quantifier can have – which gives the impression that they have very wide scope (Schwarzschild 2002). Although I believe that the 'singleton indefinite' approach should eventually match the results of the Choice / Skolem function approach, I will tentatively assume that indefinites do indeed come with an additional restriction. As a result, (52)b is analyzed as in (53):

(53)   Whenever I invite more than 2 of these 10 students *who satisfy D*, a disaster ensues.

Sometimes *D* holds true of exactly 2 students, which gives the impression that the indefinite is scoping out of the temporal clause. By parity of reasoning, (51)a should receive the analysis in (54):

(54)   3 of these 10 students *who satisfy D* are unaware that they are going to be without a job next year.

Now Heim 1983 and the Transparency theory both predict a presupposition that *all 10 students who satisfy D are going to be without a job next year*. This is much weaker than the presupposition we would have in the absence of the additional restrictor *D* (= *all 10 students are going to be*

without a job next year). If *D* holds true of exactly one individual, we might simply obtain the presupposition that *that individual is going to be without a job next year*.

   We immediately predict that if an indefinite has a 'less narrow' restriction, something closer to the expected universal presupposition should be obtained (depending on one's theory of the additional domain restriction available for indefinites, this may still fall short of a universal presupposition). In embedded examples, there should be a correlation between the island-escaping reading and the weaker-than-expected presupposition:

(55)   When one of these 10 students realizes that he is incompetent, I'll hear complaints.
       analyzed as
       When one of these 10 students *satisfying D* realizees that he is incompetent, I'll hear complains.
       a. *Reading 1*: *D* holds true of exactly one individual (impression of wide scope reading)
           ⇒ possibility of a weak presupposition: the individual that falls under *D* is incompetent.
       b. *Reading 2*: *D* holds true of all 10 students (or *D* is not present)
           ⇒ presupposition that all 10 students are incompetent.

While I believe that these predictions go in the right direction, I leave a more thorough assessment for future research.

D.   The Proviso Problem

Van der Sandt 1992 and Geurts 1999 argue that in many cases Heim's predictions are too weak (the following are modifications of examples discussed in Geurts's Chapter 3):

(56)   a. The problem was easy / difficult and it is not John who solved it.
       b. If the problem was easy / difficult, then it isn't John who solved it.
       c. Peter knows that if the problem was easy / difficult, someone solved it.

In all three cases, Heim predicts a presupposition that *if the problem was easy, someone solved it*. The Transparency theory inherits these predictions. But Geurts convincingly argues that there is a clear empirical difference between (56)a–b on the one hand and (56)c on the other: the expected presupposition is found in the latter case, but in the former case one typically infers that someone did in fact solve the problem. Van der Sandt and Geurts argue that better predictions can be achieved if an alternative account of presupposition projection is given within the framework of Discourse Representation Theory, which unlike dynamic semantics is essentially representational. The main idea is that presuppositions are species of anaphoric expressions, which want to be bound to elements of the preceding discourse. When this is not possible, the presupposition is 'accommodated', i.e. inserted in some element of the Discourse Representation Structure which is 'accessible', in accordance with some general principles – in particular, that accommodation prefers to occur with wide scope. Here is a simplified example of the procedure (after Geurts 1999 p. 55):

(57) a. Sentence: Ada will not eat mud again.
      b. DRS: not [Ada will eat mud, Ada has been eating mud]
      c. Accommodation: Ada has been eating mud, not [Ada will eat mud]

The underlined expression (57)b is the presuppositional anaphor. In the absence of an overt antecedent, it is accommodated with wide scope, as is the case in (57)c. Applied to the examples in (56)b–c, the DRT framework yields the following patterns of accommodation (the presupposition of (58)a gets accommodated as in (58)a′, and the presupposition of (58)b is accommodated as in (58)b′):

(58) a.   If the problem was easy / difficult, [not John solved it, someone solved the problem]
      a′. [someone solved the problem, if the problem was easy / difficult, [not John solved it]
      b.   [John believes that if the problem was easy someone solved it, if the problem was easy, someone solved it]
      b′. [if the problem was easy, someone solved it, John believes that if the problem was easy someone solved it]

We will not attempt to do justice to the debate between Heim and van der Sandt / Geurts (see in particular van der Sandt 1992, Geurts 1999, Beaver 2001, and Heim 1992 for discussion). Let us make three initial remarks, however.

(i)   DRT analyses are forced to stipulate for each conjunct or connective the relations of accessibility it gives rise to – which raises an immediate issue of explanatory force.

(ii) The DRT framework has considerable difficulties with quantified examples that include both a presupposition trigger and a bound variable. As we saw above, some of the clearest examples of universal presupposition are triggered by negative quantifiers:

(59)   None of these 10 students realizes that he is incompetent.
       $\Rightarrow$ Each of these 10 students is incompetent

In the absence of a preceding discourse, one must accommodate globally the fact that *each of these 10 students is incompetent*. But this observation is incompatible with the DRT framework, which starts with the structure in (60)a, and can only posit one of the patterns of accommodation in (60)b–d.

(60)   a.   [no x: student x] [x believes that x is incompetent, <u>x is incompetent</u>]
       b.   [x is incompetent] [no x: student x] [x believes that x is incompetent]
       c.   [no x: student x, x is incompetent] [x believes that x is incompetent]
       d.   [no x: student x] [x believes that x is incompetent, x is incompetent]

To account for the effect of global accommodation, one would want the presupposition to have widest scope, as in (60)b; but this forces the variable *x* to be 'unbound', which is clearly not the desired result (and in fact a 'trapping constraint' is posited in DRT to prevent precisely this). None of the other patterns yields the desired reading.

(iii) The data in (56)a–b can be manipulated by mentioning (without necessarily *asserting*) the proposition which, according to Heim 1983 and to the Transparency theory, must be presupposed:

(61)   John, who rarely knows what he is talking about, claims that if the problem was difficult, someone solved it. But in any event, if the problem was difficult, it is not John who solved it.

The first sentence does not entail or even implicate that if the problem was difficult, someone solved it. Still, the fact that the conditional proposition was explicitly mentioned suffices to make the pattern of projection predicted by Heim re-emerge.

The last observation might suggest that Heim 1983 and the Transparency theory are fundamentally correct, but that they are missing one principle. Usually it is assumed that one accommodates *the minimal amount of information necessary to satisfy the presupposition*. But if this corresponds to a proposition which is not salient, one may accommodate something stronger. We speculate that one way to guarantee that a salient proposition is accommodated is to apply Transparency to a simple clause, *without* taking into account the syntactic environment in which occurs[31]. Let us take a simplified example. In the context set C, I say *(p and qq′)*. For whatever reasons, the proposition *(if p, q)* is neither entailed by C nor salient in the discourse. Instead of computing the *minimum* accommodation necessary to guarantee that q is (incrementally) transparent, you decide, somewhat lazily, to just consider $qq′$ on its own, and to compute Transparency with respect to this constituent alone. In general, this amounts to logical overkill: it is clear that if q is transparent in $qq′$, it is also transparent in *(p and qq′)*, though the converse need not be true. But the overkill is justified because computing this stronger accommodation is certainly simpler than computing the minimum one (since you only take into account $qq′$ in isolation, and do not have to worry about the logical property of the syntactic environment in which it occurs). In addition, the result of the (rather trivial) computation is that you should accommodate q. But by assumption this is a proposition which is salient in the discourse, since q is distinguished as a 'pre-condition' of the meaning $qq′$ which was just expressed. To account for the contrast in (58), it suffices to observe that in the sentence *Peter knows that if the problem was easy, someone solved it*, the proposition *if the problem was easy, someone solved it* is already present in the sentence, and thus it is certainly made salient

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[31]   See Beaver 2001 and Heim 2006 for a somewhat different line of investigation.

in the discourse. As a result, there is no temptation to accommodate anything else[32]. We leave it for future research to determine whether this line of investigation can account in full generality for van der Sandt's and Geurts's data.

E.   Quasi-presuppositions

Up to this point, we have restricted attention to examples in which a meaning was either expressed as a single lexical item $\underline{dd'}$, or was fully articulated by a conjunction *(d and $\underline{dd'}$)*. But there could be intermediate cases, in which a conjunctive meaning is expressed by some other syntactic construction. This situation is indeed exemplified by adverbial modification, and we believe that it gives rise to 'quasi-presuppositions', i.e. to presupposition-like phenomena that are triggered at the compositional level and are weaker in force than standard presuppositions (see also Simons 2001 for relevant discussion). Consider the following sentences, uttered after someone asked *What happened yesterday?*[33]:

(62)   a.   John wasn't late.
              ⇒ John came.
          b.   John didn't come late.
              ⇒ John came [possibly, weaker inference than in (a)]

(63)   a.   None of my 10 students was late.
              ⇒ Each of my 10 students came.
          b.   None of my 10 students came late.
              ⇒ Some of my 10 students came [strong inference]
              ⇒ Each of my 10 students came [possibly, weaker inference than in (a)]

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[32]   As noted by B. Spector (p.c.), the solution we have sketched does not depend on the details of the Transparency framework, and it could be applied just as well to Heim's theory.

[33]   The question is intended to force broad focus on the entire answer, rather than narrow focus on *late*. If *late* were focused, the presupposition-like phenomena we observe would be unsurprising: this would force *John came* to be given (in the sense of Schwarschild 1999). But it is well-known that out-of-the-blue contexts one tends to treat given material as if it were presupposed. It is to control for this possibility that we use a context that requires broad focus.

The facts in (62)a and (63)a are rather unsurprising; they just suggest that *be late* is a presupposition trigger, analyzed as $\underline{P}P'$ with $P = came$. The data in (62)b and (63)b are more puzzling because *came late* is not a single lexical item. (62)b by itself is compatible with two explanations. One is that (i) for whatever reasons, *came late* is also analyzed as $\underline{P}P'$, with $P = came$. Alternatively, it may be that (ii) the expression *came late* evokes the alternative *came*, which in a negative environment yields stronger truth conditions. This, in turn, should trigger a scalar-like implicature according to which *it is not the case that John didn't come*, i.e. that *John came*, just as is observed. This line of explanation also accounts for the strong inference found in (63)b: from *it is not the case that none of my 10 students came*, we derive that *some of my 10 students came*. On the other hand, this *does not account* for the inference that we also obtain that *each of my 10 students came* (though I believe that this inference is weaker than the existential one). Such a universal inference in negative environments is a hallmark of presuppositions, not of implicatures. The suggestion I would like to make is that *came late* is indeed analyzed as $\underline{P}P'$ because (i) *came* is a 'pre-condition' of *came late*, and (ii) although the expression is syntactically complex, it is not as fully articulated as a full-fledged conjunction (e.g. *John came, and did so late*).

   If this analysis is on the right track, we might expect that by changing the form of the adverbial modifier, we might be able to make its behavior closer to that of a 'real' conjunction. I believe that this pattern may be found in French when one compares *venir en retard* ('come late') with the somewhat pedantic *venir en étant en retard* ('arrive while being late'). The first expression triggers a quasi-presupposition, but the second doesn't, or it triggers a far weaker one (I also provide an example with *être en retard* ('be late') to serve as a presuppositional control):

(64)   a.   Aucun de mes 10 étudiants n'a été en retard.
             None of my 10 students NE has been late
             ⇒ inference that each of my 10 students came
       b.   Aucun de mes 10 étudiants n'est venu en retard.
             None of my 10 students NE has come late
             ⇒ inference that each of my 10 students came
       c.   Aucun de mes 10 étudiants n'est venu en étant en retard.
             None of my 10 students NE has come in being late

$\Rightarrow$ no inference (or very weak inference) that each student came

F.   The role of linear order

In the incremental version of Transparency, we have taken linear order to be crucial. But it would be reasonable to explore versions of the theory in which syntactic structures are ordered by other principles. In fact, it would make good conceptual sense to take *order of processing* to be the primitive notion, without being committed to the view that the order of processing is just linear order. Other alternatives could be considered as well, for instance ordering by the syntactician's notion of 'c-command'. Different predictions would not doubt be obtained.

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As brief as possible (but no briefer)*

DAVID I. BEAVER

1. Introduction

For years researchers struggle to explain an impossible muddle of data, and then BAM! some genius comes and publishes an article in *Theoretical Linguistics* that turns everything on its head. In this case, the bugbear is the projection problem for presuppositions. The mind-blowing solution succeeds in explaining presuppositional inferences and felicity judgments without the abstruse non-classical logics or transformations of logical forms that others tried previously, but instead with standard classical logic. Most importantly, for this is what makes the innovative everything-on-its-head proposal special, it solves the problem not in terms of projection, but in terms of local satisfaction.

   The paper to which I refer is, of course, Lauri Karttunen's (1974) *Presupposition and Linguistic Context*, published in the very first volume of this journal. Philippe Schlenker's (henceforth: PS) *Be Articulate: A Pragmatic Theory of Presupposition* is an important but flawed postscript to Karttunen's paper. The current work is a postscript to PS's postscript. After a little warm-up exercise to help us get into a suitably critical frame of mind, I will put PS's contribution in context, and then point to some failings and peculiarities.

2.   **Warm-up exercise**

Surprise quiz! What do the following three examples presuppose?

(1)   If Barack is pleased that he won and Hillary is upset that Barack won, that should not surprise anyone.

(2)   Maybe it's a Californian who's paying for a space flight and the person paying for a space flight is a tech millionaire.

(3)   It's not the case that the King of France is bald and the King of France is rich.

If you said that they presuppose that Barack won, that someone's paying to fly into space, and that there is a King of France, then I agree with you. But these are not the presuppositions predicted by PS. In fact, PS predicts that these examples have no presupposition at all.[1]

PS's model depends on checking for each presupposition trigger whether it would have been better to state the presupposition explicitly: in his words, to *articulate* it. We can show that PS predicts no overall presuppositions for a complex sentence by considering an utterance context that supports no relevant information, and then asking for each occurrence of a presupposition trigger in the sentence whether the speaker should have been more explicit. Specifically, we must ask for each presupposition trigger whether it would have been better for the speaker to have articulated the presuppositional material associated with that trigger.

Consider (1), which includes the trigger "pleased that he [i.e. Barack] won". Articulating the presupposition would amount to replacing "Barack is pleased that he won" by the more explicit "Barack won and he is pleased that he won." But according to PS's model, the second conjunct "Hillary is upset that Barack won" entails that Barack won (as well as presupposing it). Therefore, in PS's model, addition of "Barack won" before the first conjunct would be redundant. And according to PS's model,

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[1]   I am ignoring certain irrelevant presuppositions here, like the presupposition of the use of a proper name. Adding these to the mix, PS would predict that (1) presupposes the existence of a salient person named "Hillary." Oddly, he would not predict that it presupposes the existence of anyone named "Barack".

adding redundant material violates the Gricean maxim Be Brief, or at least a special version of that maxim, Be Brief (Symmetric).

Similarly, articulating the second conjunct of the antecedent of (1) to form "Barack won and Hillary is upset that Barack won" would also violate Be Brief. So, articulating the presupposition of the second conjunct is ruled out. Therefore, even in a context that supports no relevant information about whether Barack won, we should not articulate either of the locally triggered presuppositions that Barack won.

According to PS, the presuppositions of a complex sentence are all the propositions that must hold in contexts of utterance so as to make articulation of presuppositions of the parts of the sentence unnecessary. But we just pointed out that even in an empty context, one where no relevant propositions hold, articulating the presuppositions of the parts of the sentence would create violations of PS's version of Be Brief. Therefore sentence (1) as a whole is predicted to have no non-trivial presuppositions, and in particular does not presuppose that Barack won. Of course, PS is wrong about this.

In (2), a presupposition is triggered once by a cleft and once by a definite, and in (3) we simply have the same definite description occurring twice. Similar argumentation to that I gave for (1) would show that these examples are also incorrectly predicted to have no presuppositions.

When the same thing is presupposed two or more times, PS's system produces odd consequences. Similarly if we have presuppositions A, B and C in an appropriate configuration, where the conjunction of A and B entailed C, PS predicts no presupposition. This may be a just a technical error, but it is a concern none the less.[2]

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[2] The problem I have pointed out in this section hinges on the assumption that presuppositions are entailed by their triggers, so one might consider the possibility of presuppositions not being entailed. However, PS seems to take it as a basic tenet that they are entailed, perhaps because otherwise there is no motivation for locally articulating them, and perhaps because otherwise the semantics of some expressions (e.g. definites) would be greatly complicated.

It is, perhaps, worth pointing out that there has been prior discussion in the literature of the question of whether presuppositions are locally entailed by the their trigger, e.g. by Gazdar (1979). Heim (1992) offers some evidence that the additive "too" is not locally entailed. Here are some naturally occurring examples I found on the web which illustrate the same point:

3.   **Crumbs from Karttunen's table**

There are certain respects in which PS's proposal is like Karttunen's, and certain respects in which it differs. Let us start with the similarities.

Karttunen advocated a pragmatic explanation of presupposition behavior, such that the semantics of sentential connectives and other operators can be given in terms of standard classical logic. As well as assuming a standard (static) bivalent semantics, Karttunen used only classical logic in the calculation of presuppositional behavior: "… it comes down to having for each simple sentence a set of logical forms which are to be entailed (in the standard logical sense) by certain contexts." (Karttunen, 1974, p. 185)

Now we come to Karttunen's central insight. The presuppositions of complex sentences do not emerge directly, but result indirectly by figuring out in what contexts the presuppositions are satisfied, where a context is just a set of propositions: "What is important is that we define satisfaction for complex sentences directly without computing their presuppositions explicitly." (Karttunen, 1974, p. 185)

But how do we know when a complex sentence is satisfied in a context? The satisfaction of the complex sentence is determined in terms of local satisfaction of its parts: "… a given initial context satisfies-the-presuppositions-of a complex sentence just in case the presuppositions of each of the constituent sentences are satisfied by a certain specific extension of that initial context.… Context X satisfies-the-presuppositions-of S just in case the presuppositions of each of the constituent sentences are satisfied by the corresponding local context." (Karttunen, 1974, p. 187) This led Karttunen to a notion of presupposition like the following:

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  i)   I'll fake a smile, if you do too

 ii)   I'll keep singing if you do too

iii)   I'll stay sweet if you do too.

If "too" locally entailed its presupposition, then (i) would mean something like "I'll fake a smile if you fake a smile and someone other than you (me?) fakes a smile." But it doesn't mean that. Suffice it to say that PS's assumption that triggers entail their presuppositions is problematic, though the problem is not unique to PS.

Karttunen Presupposition Principle   A presupposes B if B holds in all contexts C such that the individual presuppositions of parts of A are satisfied in their local contexts when A is interpreted in C.

Karttunen defined precise local satisfaction conditions for a range of expression types, using the following general motivation: "In compound sentences the initial context is incremented in a left-to-right fashion giving for each constituent sentence a *local context* that must satisfy its presuppositions" (Karttunen, 1974, p. 187)

In all the respects above, PS shadows Karttunen. But it is at this point that we find a crucial innovation. Karttunen showed how local satisfaction conditions can be defined for each connective and operator he considered, but PS is the first to provide a general recipe for calculating Karttunen's local satisfaction conditions. PS's approach is based on pseudo-Gricean maxims that he made up specially for the purpose, but PS's idea can be cashed out in a formally equivalent way, and without reference to maxims, as follows:

Triviality   Call S′ a *rightward refill* of a sentence S if it's just like S except all material to the right of A has been replaced with some arbitrary new material (provided the result is grammatically acceptable, and the new material contains no anaphoric links to A). Call S″ is an *A-trivialized version* of S′ if S″ is just like S′ except A has been replaced by a tautology. Then, A is *(incrementally) trivial* in S in context C iff for any rightward refill S′ of S, with A-trivialized version S″: C satisfies S′ iff C satisfies S″.[3]

Local Satisfaction   Suppose B is a subpart of sentence S. A is locally satisfied at the point where B occurs if A would be (incrementally) trivial in the sentence obtained by replacing B by A in S.

For example, "John is a grandparent" comes out as trivial in (4) in any global context that entails that John is Mary's father, at least if

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[3]   Note that definitions of what parts of a formula are trivial played an important role in presupposition theory well before PS's paper. See the definition of Local Informativity in the Beaver (1997, 2001) implementation of van der Sandt (1992), and the extensive use made of such notions by Blackburn et al. (2001) and Blackburn and Bos (ms). The definition of *incremental triviality* given above is intended to capture the version of PS's model using his incremental brevity constraint. It would be straightforward to define *symmetric triviality*, by analogy with PS's symmetric version of Be Brief.

we assume general knowledge of family relationships. Thus, in the same context, "John is a grandparent" is locally satisfied where "John's eldest grandchild" occurs in (5).

(4)   If Mary has five children and is very rich, then John is a grandparent.

(5)   If Mary has five children and is very rich, then John's eldest grand-child will inherit everything.

More generally, the presupposition "John is a grandparent" is locally satisfied at the point where the presupposition trigger "John's eldest grandchild" occurs in (5) relative to any global context that implies that if "Mary has five children and is very rich, then John has a grandchild." So this latter sentence is what is presupposed by (5), if by invocation of the Karttunen Presupposition Principle. And the marvelous thing about the derivation is that it makes no reference to specific properties of the conditional or any other construction. For 34 years prior to PS's work, there was no way of giving Karttunen-type derivations of presupposition with such generality.

4.   When even the best is not good enough

PS claims that presuppositions may be satisfied on both the left and the right. He further claims that when they are merely satisfied on the right, the resulting sentences are generally not quite as felicitous as sentences where the presupposition is satisfied on the left, but are not as infelicitous as sentences where the presupposition fails completely.

I do not believe that the empirical methodology employed by PS is sufficient to justify such delicately layered conclusions, and I do not accept that PS has demonstrated that in general presuppositions may be satisfied to the right, as if they were *post-suppositions*. His prediction would be that in the context of (6), (6a) would be infelicitous, (6b) would be acceptable or, at most, slightly infelicitous, and (6c) would be completely felicitous. On my judgments, and this tallies with responses I received from the five other native speakers of English I asked, (6b) is just as infelicitous as (6a). So I don't see any clear reason to think that the presuppositions of

additives like "too" can be right satisfied.[4] Similar comments apply to the examples in (7), involving the cleft construction as presupposition trigger, and (8), which uses the factive noun *fact* as its trigger.

(6)   I expect nobody escaped.
    a.   ?But if Jane escaped too, then we need to tighten security.
    b.   ?But if Jane escaped too and Fred escaped uninjured, then we need to tighten security.
    c.   But if Fred escaped uninjured and Jane escaped too, then we need to tighten security.

(7)   I expect nobody escaped.
    a.   ?But Fred thinks that it's Jane who escaped.
    b.   ?But Fred thinks that it's Jane who escaped and that someone escaped uninjured.
    c.   But Fred thinks that someone escaped uninjured and that it's Jane who escaped.

(8)   I expect nobody escaped.
    a.   ?But perhaps the fact that Jane escaped became public, in which case we need to tighten security.
    b.   ?But perhaps the fact that Jane escaped became public, and Jane escaped uninjured, in which case we need to tighten security.
    c.   But perhaps Jane escaped uninjured and the fact that Jane escaped became public, in which case we need to tighten security.

Still for current purposes, I will suspend disbelief and accept PS's judgments, so that in each of the above examples, the (b) example gets what PS lists as a "?OK" rating rather than a "?". The point I now want to make is that the theory finally settled on by PS in order to explain what he sees as the data is peculiar.

Consider how the PS model predicts presuppositions. We suppose that in context C, a speaker has to choose between producing S and S′. S

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[4]   My comments on "too" relate to a wider concern with PS's project: he does not say anything specific about so-called *anaphoric* presupposition triggers (the terminology is used by Zeevat (1992)). And, more generally, PS does not directly address any of the phenomena that caused van der Sandt (1992) and Geurts (1999) to argue that presuppositions must be anaphorically resolved, rather than satisfied.

contains a presupposition trigger A, such that A presupposes B, and S′ is just like S except A is replaced by "B and A." Now, by assumption, S violates Be Articulate. But if the presupposition is locally satisfied relative to the global context C, then S′ would violate brevity maxims, which, for reasons that PS never explains, are stronger constraints than Be Articulate.[5] So whenever a presupposition would be locally satisfied, the speaker produces the simpler S rather than S′. More generally, PS's derivation of presuppositions can be summed up by a principle like the following:

Schlenker Presupposition Principle   S presupposes P if P holds in all global contexts in which an utterance of S would be as brief as possible, but no briefer. That is, S leads to less egregious pragmatic violations of brevity and articulateness maxims than some S′ with an added conjunct.

Now recall PS's claim about the data: sentences with left satisfied presuppositions are more felicitous than sentences with only right satisfied presuppositions, which in turn are more felicitous than sentences with completely unsatisfied presuppositions. PS's explanation of this data is given in terms of the relative ranking of his maxims: Be Brief (Incremental) is stronger than Be Brief (Symmetric), while both are stronger than Be Articulate. But PS still has some work to do, since in any standard system for managing defeasible constraints, such as Optimality Theory (OT), or various non-monotonic logics, this would not be sufficient to explain the pattern of data he describes.

In standard OT, for example, ranking Be Brief (Incremental) above Be Brief (Symmetric) would not have any effect at all on the relative felicity of a non-left satisfied presupposition and a totally non-satisfied presupposition. For lack of satisfaction occurs only when the brevity maxims are

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5   It seemed arbitrary to me that Be Brief should be stronger than Be Articulate, until I began to think about whether Be Articulate makes sense as a maxim of conversation anyway. For conversational maxims, by their nature, are of great generality and naturalness. But Be Articulate is highly specific, referring directly to presuppositions and conjunctions of a certain sort. Whether PS can give it a motivation or not, Be Articulate hardly has the apothegmatic profundity or Confucian zing of Grice's delicious (but slippery) formulations. Then again, to the extent that Be Articulate is itself a poorly motivated maxim, it at least makes sense that it should be weaker than Be Brief, a principle of such generality that its applications run the gamut from coding theory to philosophy of science. I do not dare to speculate on whether PS would consider the poor motivation of Be Articulate a point in his favor.

obeyed, and the articulateness maxim is violated. Thus, (8a) has a totally non-satisfied presupposition and generates one violation of Be Articulate. Similarly (8b), which has a left non-satisfied presupposition, also generates exactly one violation of Be Articulate. So far then, it does not seem obvious why one should be worse than the other. But in OT, the felicity of a possible output depends not on what violations the output gets, but on whether it gets fewer violations than its competitors. Let us accept, as PS suggests, that there is only one other relevant competitor, one which makes the presupposition explicit.[6] In the case of (8a), the competitor would be (8a′):

(8)   a′.   But perhaps Jane escaped and the fact that Jane escaped became public, in which case we need to tighten security.

Evaluating (8a,a′) in the global context set up by (8), a context which does not satisfy the presupposition that Jane escaped, and does not satisfy any other relevant propositions, we obtain the following OT tableau, which establishes that (8a) should be infelicitous because it loses to a competing output.

(9)

	Be Brief Incremental	Be Brief Symmetric	Be Articulate
(8a)			*
☞ (8a′)			

For (8b) and (8c), the relevant alternative productions to consider are those in (8b′) and (8c′), respectively, and we obtain the tableaux in (10) and (11).

(8)   b′.   But perhaps Jane escaped and the fact that Jane escaped became public, and Jane escaped uninjured, in which case we need to tighten security.

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6   There is a standard OT approach to ensuring that these are the only competitors needing to be considered. We would assume that there was some fixed meaning that the speaker needed to express, and add a high-ranking faithfulness constraint forcing outputs to correspond to that meaning. The faithfulness constraint would be defined in such a way that it ruled out all competitors except the two at hand.

c′.   But perhaps Jane escaped uninjured and Jane escaped and the fact that Jane escaped became public, in which case we need to tighten security.

(10)

	Be Brief Incremental	Be Brief Symmetric	Be Articulate
☞ (8b)			*
(8b′)		*	

(11)

	Be Brief Incremental	Be Brief Symmetric	Be Articulate
☞ (8c)			*
(8c′)	*	*	

Since (8b) and (8c) win their respective competitions, standard OT predicts them both to be acceptable. In fact, it is easily seen that in the competitions PS sets up, standard OT would always predict exactly the same results with his full set of three constraints as it would without the incremental brevity constraint.[7] But this is not what PS wants, so he cannot use standard OT to predict infelicity.

To get the results he wants, PS invokes a new principle for measuring the felicity of outputs. As he says: "(i) Be Brief leads to greater deviance when its incremental version is violated than when only its symmetric version is, and (ii) the acceptability of a sentence is inversely correlated to that of its competitor." Since (8c′) is less acceptable than (8b′), we derive that (8c) is more acceptable than (8b), and yet less acceptable than (8a) – precisely in accord with PS's judgments, though not those of my consultants.

However, it now seems that the only utterances which PS predicts to be completely felicitous are those for which two conditions hold: first, the presuppositions are all incrementally satisfied, à la Karttunen, and second, there must be a competitor for which some presuppositions are not

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[7]   To see this, note that Be Brief (Incremental) entails Be Brief (Symmetric).

incrementally satisfied. This last condition strikes me as very worrying indeed. Consider one of PS's own worked examples, his "Example 1", considered in a context where it is not established that John used to smoke:

(12) a. John has stopped smoking.
      b. John used to smoke and he has stopped smoking.

We obtain the tableau in (13). Although standard OT would predict that (12b) was felicitous, PS predicts that it should be infelicitous to some degree, and indeed less felicitous than e.g. (8b) (an example which for PS would be ?OK, and which, for my consultants, is completely infelicitous). Why? Well, simply because its competitor (12a) suffers from no brevity-induced deviance at all, but only a mild articulateness violation.

(13)

	Be Brief Incremental	Be Brief Symmetric	Be Articulate
(12a)			*
☞ (12b)			

In general, it is essential to PS's approach that whenever a speaker is considering producing a sentence in a global context such that a presupposition embedded in the sentence would not be locally satisfied, the speaker prefers to articulate the presupposition separately. But in fact PS predicts that in all such cases, articulating the presupposition will produce a result that is mildly infelicitous, because the competing sentence does not violate any high ranking constraints. Thus, for example, PS predicts that all the sentences in (14–16) should be less than perfectly acceptable in global contexts which say nothing about whether there is a French King, whether John is smart, and whether Mary is married, respectively. In fact, all three sentences are perfectly acceptable in such contexts.

(14) If there is a King of France and the King of France is bald, he probably wears a crown the whole time.

(15) Perhaps John is smart and he knows it.

(16) Either Mary is rich, or else she's married and her husband is rich.

One of PS's proudest claims is that he has assimilated presupposition projection to neo-Gricean pragmatics, and thereby explained

presuppositional behavior without invoking special purpose machinery in the way that everyone else does. But there is no evidence at all that PS's peculiar method of relating felicity to violations of maxims would be appropriate for Gricean maxims in general. Failing this, PS's claim that his constraints are Gricean in character would seem to be misplaced.

PS's non-standard method of applying constraints is clearly problematic. No doubt some variant approach to assessing violations will solve the problems alluded to above.[8] But I would caution here that I am already concerned that the existing solution is *ad hoc*. I say that because it is not standard in any other linguistic domain to use a trans-derivational

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[8] In fact, PS does consider, and dismiss, some alternative ways of deriving the data that eventually motivate the symmetric brevity constraint and its attendant non-standard method of constraint evaluation. His second favorite approach is to stick with an asymmetric satisfaction system, and use *local accommodation*. I am not able to follow any of PS's arguments against local accommodation, and will not comment on these further. But I would note that as far as I can see, local accommodation as standardly conceived is not a natural alternative for PS. Systems based on DRT or dynamic semantics, e.g. Heim (1983), van der Sandt (1992), Zeevat (1992), Geurts (1999), and Beaver (2001), depend crucially on intermediate contexts that speakers build up as they process a sentence. Local accommodation is then a process of manipulating one of these contexts, e.g. adding extra constraints or conditions on them. But the theory of PS does not involve explicit reference to contexts or representations. It only involves consideration of what would or would not be trivial at a given point within an English sentence.

For PS, it seems that local accommodation of some expression E would involve something like pretending the speaker had actually said E at that point. But it is entirely unclear to me how this would help. If the hearer really is prepared to pretend that the locally accommodated E was uttered, then the hearer will presumably also need to also pretend that there was a brevity violation. And if on the other hand the pretend utterance of E does not count as a brevity violation, then why should we see it as avoiding a violation of Be Articulate? Or does PS envisage local accommodation as having the effect of articulating a presupposition without a brevity violation? If so, then it counts as a quite extreme form of pretense, and presumably there would have to be a relatively high-ranking maxim (Avoid Extreme Pretense!) to prevent it happening all the time.

But where, I wonder, could this maxim be ranked so as to have the desired effects? If it was higher ranked than Be Articulate, then it would have no effect, because in cases where a presupposition would not otherwise be satisfied, we would always prefer not to locally accommodate, and put up with an articulateness violation instead. If it was lower ranked than Be Articulate, then we would never articulate a presupposition, because local accommodation would be a preferred strategy. This would be empirically incorrect, and would anyway undermine PS's entire proposal. So I find myself at a loss to understand how PS could implement local accommodation in his system, even if he wanted to.

constraint directly linking the degree of felicity of one sentence to the degree of infelicity of another.[9] And the result of this system is that there are some meanings for which all the candidate outputs that a speaker might use are to some degree infelicitous. That is, PS predicts that some meanings are ineffable, or at least that you can only *eff* them with some awkwardness. Put differently, in PS's variant of OT, sometimes even the best is not good enough.[10] A nice thought, indeed, but I wonder whether it is really germane to the empirical issue at hand, namely presupposition projection.[11]

5.   More free predictions (but you get what you pay for)

For the logical connectives and some other operators, PS does a remarkably good job of deriving projection behavior, albeit that, for reasons I have indicated, I have doubts as regards some of the predictions of the symmetric system. But what happens when we move beyond the standard logical connectives?

Consider the connective "because", as in (17a). To figure out what PS predicts this presupposes, we first articulate the presupposition (here triggered by: "the storm") as in (17b). Then we have to identify the set of all contexts in which "there is a storm" is redundant in sentences properly adapted from (17b), and figure out what is common to all these contexts. Restricting myself to incremental brevity (meaning that we can effectively ignore the contribution of "it's far away"), it seems that what all these contexts have in common is that they support (17c). More generally, PS apparently predicts that a sentence "A because B_p" (where the subscript indicates that p is a presupposition triggered by B) presupposes "If A then

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9   That is not to say that PS's link between felicity of one sentence and infelicity of another is uninteresting. On the contrary: it reminds me very much of phenomena I have observed involving distributional data in existential constructions – see Beaver et al. (2005).

10   Here I echo an old theme in OT, perhaps starting with Orgun and Sprouse (1996).

11   Certainly PS's approach seems foreign to the wider enterprise of Gricean pragmatics. But I wonder if Gricean flouting could be used as part of an argument in favor of PS's approach. A flout involves the violation of one maxim in order not to violate another more important principle. So the acceptability of the flout would then be related to the seriousness of the violations incurred by the competing alternative utterance.

part of the reason that A is p". That seems to me to be incorrect. More plausibly, the presupposition is simply that p holds (i.e. that there is a storm). Or, sticking to what a Karttunen-type system would presumably generate, the presupposition might be "if A then p" (i.e. if Mary is happy, then there is a storm).

(17) a. Mary is happy because the storm is far away.
      b. Mary is happy because there is a storm and it's far away.
      c. If Mary is happy, then one of the reasons is that there is a storm.

What about temporal connectives? Consider sentences of the form "A before B$_p$", as in (18a). By consideration of the articulated alternative (18b), we determine ... well, we determine that PS's principles are not easy to apply. But so far as I can see, the result that he predicts is the presupposition in (18c). Again, this is clearly incorrect.

(18) a. Mary went to the doctor before John realized she had been sick.
      b. Mary went to the doctor before she had been sick and John realized it.
      c. If Mary went to the doctor, then she did so before she had been sick.

I believe that there are many constructions for which PS's principles are difficult to apply or produce peculiar results. But I will limit myself to one last type of construction, comparatives. What, we may ask, are the presupposition projection characteristics of comparatives? What, for example, is the presupposition of the comparative in (19a), which has a definite description embedded in a comparative clause? To answer this in PS's system, we should examine the articulated competitor in (19b). But the articulated competitor is infelicitous. It seems that PS's system simply fails to make a prediction here.

(19) a. Mary is thinner than the King of France is fat.
      b. ?Mary is thinner than there is a King of France and he is fat.

More generally, PS has found a neat way to calculate local satisfaction conditions automatically. But as he realizes (and indeed takes to be a positive) this leaves him with no flexibility. Karttunen can, in principle,

define whatever local satisfaction conditions for an operator he chooses.[12] But PS is committed to deriving all satisfaction conditions from general pragmatic principles. So if it should turn out that there are operators for which these general pragmatic principles make incorrect predictions, then the principles must be wrong. Or else the principle of using only these principles is wrong. PS's program is an attempt to state the briefest theory of presupposition possible. But the examples I've presented indicate that some individual specification of satisfaction conditions for different operators might be necessary. If so, then PS's theory is too brief.

6. Conclusion

PS is not primarily a competitor to Karttunen (1974): it is, rather, a way of motivating something like Karttunen's approach. It is not clear to me yet how broadly PS's motivation applies, for as we saw in the previous section, even if we restrict ourselves to the incremental part of PS's system, it fails to generate correct predictions for some operators. Yet if we see PS as providing the beginnings of an explanation as to what was right in Karttunen's model, rather than as a wholesale replacement for Karttunen's model, then I believe we can get the best of both worlds. And if we happen to be dynamic semantic stalwarts, then we can perhaps see PS as providing an explanation for why certain dynamic meanings for connectives and operators should arise historically. In this case, we would have a pragmatically motivated theory that allowed for peculiarities to creep in to the satisfaction properties, or dynamic meanings, of individual operators.

   PS succeeds in motivating Karttunen's model, but PS attempts to go further. I find the further developments in PS's paper provocative and interesting. However, the data motivating a symmetric approach to local satisfaction is, in my view, slim, and I have presented examples which mitigate against it – (6b), (7b), and (8b). The peculiar trans-derivational

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[12]   In this respect, dynamic semantic approaches, like that of Heim (1983, 1992) have the same flexibility as Karttunen's. Indeed, much of Heim (1992) is taken up with a consideration of whether there is a way of defining belief operators such that the right projection behavior results.

comparison PS uses to predict what he sees as the data on symmetric satisfaction is *ad hoc* and generates completely incorrect predictions, for example incorrectly predicting mild infelicity for (12b), (14), (15), and (16). There are, furthermore, additional technical problems with PS's approach, for example the incorrect prediction that (1), (2), and (3) lack presuppositions. The problems I have discussed suggest to me that none of the developments in PS's paper, other than those which support Karttunen's (1974) model, are ready for prime time.

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Transparency theory: Empirical issues and psycholinguistic routes*

EMMANUEL CHEMLA

1. Achieving explanatory force

The transparency theory of presupposition projection advocated by Schlenker (2008a) relies on two fairly independent assumptions. First, it describes the interaction between two Gricean maxims of manner given in (1) and (2). These two maxims together govern the use of explicit conjunctions and complex meanings (presuppositional items) to package information.

(1) Be Articulate:
    In any syntactic environment, express the meaning of an expression $\underline{d}d'$ as *(d and $\underline{d}d'$)*.[1]

(2) Be Brief (in brief):
    A predicative or propositional occurrence of *(d and x)* is infelicitous in a position where *d and* is useless (i.e. in a position where any two expressions of the form *(d and β)* and β lead to contextually equivalent sentences).

These maxims lead to the following prediction:[2]

(3) General prediction of the transparency theory:
    A sentence of the form $\varphi(\underline{d}d')$ presupposes that $\forall \beta \in \mathscr{L}$, $\varphi(d \wedge \beta) \Leftrightarrow \varphi(\beta)$.

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[1] Notations: The underlined parts stand for presuppositional pieces of meaning.
[2] Notations: $\varphi(\ldots)$ represents a generic environment where presuppositional material like $\underline{d}d'$ can be embedded. $\mathscr{L}$ represents the set of expressions of the appropriate type in the language.

Interestingly, one can show that in the propositional case, this prediction is equivalent to $\varphi(d) \Leftrightarrow \varphi(\top)$, i.e. we only need to consider one possible sentence completion β: the tautology. Importantly however, this is only a (very efficient) technical shortcut and lengthy tautologous pieces are not necessary (see Chemla, 2006). This first part of the theory accounts for the core projection facts: projection under negation, conditionals, quantified sentences etc.

Second, there is a processing module which governs the stage at which these Gricean mechanisms apply:

(4)   *Be Brief* may take into account the whole sentence or it may abstract away from the end of the sentence and only take into account what precedes the (structural) position at which the presupposition trigger occurs.

This second insightful hypothesis introduces some optionality in the system, which thus can capture usual presuppositional linear asymmetries. In short, the effects of presupposition triggers can be neutralized when they appear *after* the justification of their presupposition. For instance, if a presupposition trigger appears in the second half of a conjunctive sentence, and if the first conjunct entails the resulting presupposition, no presupposition is projected for the overall sentence, as in the following caricatural example:

(5)   It is raining and Mary knows it/that it is raining.

Empirically speaking, the transparency theory is equivalent to the earliest and most robust versions of dynamic semantics such as Heim (1983) for a very wide variety of cases (full proof in Schlenker, 2007). This empirical success is achieved without any assumption about the environments in which presupposition triggers may appear. The outcome only depends on the standard bivalent meanings of the various parts of the sentences involved: no speculation about, e.g., negations or conjunctions is needed (this criticism of dynamic approaches was already discussed in, e.g., Soames, 1989).

Let me illustrate this point with a slightly less usual example. The exact semantics of conditional sentences is a matter of debate, and it is standard methodology to give them the semantics of material implication: the meaning of *If a, b* is close to the meaning of *(¬a or b)*. From this

approximation, the dynamic meaning of a conditional could be reconstructed from the dynamic meanings of negation and disjunction.

This is bad methodology for at least two reasons. First, there is more than one way to emulate the truth-conditions of material implication with negations and disjunctions – e.g., *(¬a or b)*, *(b or ¬a)*. The problem is that each of these translations may lead to a different dynamic meaning for the overall expression so that the link between the conditional and the relevant translation needs to be motivated independently.[3] Second, conditional sentences are not material implications to begin with. The closeness in truth-conditions does not imply that there is any level of representation at which the two expressions are built from similar subcomponents (e.g., negation and disjunction). The situation is rather different with a semantically predictive algorithm like, e.g., the transparency theory. The input of such systems is the bivalent meaning of an expression,[4] the output is its presuppositional behavior. If we want an approximation of the output, it is fair to use an approximation of the input, i.e. an approximation of the truth-conditions, because no intermediate level of representation is needed before we can apply the algorithm. More importantly, any refined semantics for the conditionals could just as well feed the algorithm and lead to testable predictions.[5]

So, the transparency theory resolves an old tension. Dynamic approaches are empirically powerful, but this has a serious cost: they are not predictive. The transparency theory is fully predictive and yet matches previous empirical results. That could be the end of the story: someone motivated what dynamic approaches got from stipulations. Paradoxically, the impact of the transparency theory on the field is quite the opposite so far: new competing approaches to presupposition projection emerge rapidly (Chemla, 2008b; Klinedinst and Rothschild, 2008; George, 2008;

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[3] LaCasse (2008) recently investigated a way to constrain the space of possible dynamic meanings for connectives. Rothschild (2008) investigated a different route. He offers a way to derive the dynamic semantics of a given expression (e.g., a conditional) from the combination of all its possible reformulations.

[4] Some minimal information about the order of the various pieces is also needed in the incremental version of the algorithm.

[5] I believe it is only for "pedagogical" reasons that this is not the route that Schlenker explores: he tries to make as easy as possible the comparison between the transparency theory and dynamic semantics.

LaCasse, 2008; Rothschild, 2008 and even Schlenker, 2008b). To me, this multiplication of new theories is due to the fact that Schlenker's work also reveals that:

1. A predictive theory is possible: Schlenker offers various insights towards a predictive system, in particular the processing module mentioned in (4) is now available for virtually any predictive approach.[6]
2. The empirical discussion is not settled. I will focus the rest of my comments on a particular aspect of this last point: projection from the scope of quantifiers.

2. Quantified sentences

2.1. *The data*

Sentence (6) contains a presupposition trigger, *know*, in the scope of the quantifier *no*. What is the resulting presupposition of this type of sentences?

(6)   None of these 10 students knows that he is stupid.

There are two common answers to this question in the dynamic literature. Heim (1983) argues that (6) has the universal presupposition given in (7a). On the other hand, Beaver (1994, 2001) argues that it has the much weaker existential presupposition given in (7b). See Kadmon (2001, chapter 10) for discussion.

(7)   a.   Each of these 10 students is stupid.
      b.   At least one of these 10 students is stupid.

   The transparency theory goes with the first camp and predicts that presuppositions triggered from the scope of a quantifier give rise to universal presuppositions. This prediction is not dependent on the quantifier, and sentences like the following are predicted to raise the same universal presupposition:

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[6]   Interestingly, this principle is not a priori restricted to presupposition projection theories, but may also apply to algorithms used to compute other kinds of implicatures (e.g., scalar implicatures where this principle could add a lot to the debate between so-called *globalists* and *localists*).

(8) a. Less than 3 of these 10 students know that they are stupid.
     b. More than 3 of these 10 students know that they are stupid.
     c. Exactly 3 of these 10 students know that they are stupid.
     d. *Quantifier* of these 10 students know that *Bound pronoun* is stupid.

These predictions are problematic. From an utterance of (6), it is natural to infer that (7a) is true, but the strength of this inference decreases greatly for utterances of any of the sentences in (8). This claim is confirmed by experimental investigations described in Chemla (2008a). These data are mentioned in appendix B of Schlenker (2008a) but no solution is offered.

From the perspective of dynamic semantics, the presuppositions of quantified sentences are driven by the lexical entry of the quantifiers. In principle, it is technically possible to encode different presuppositional behaviors for different quantifiers, but this would be difficult to motivate on independent grounds and it is more parsimonious to postulate uniform presuppositional properties for all quantifiers. In a predictive framework, the difference in bivalent meanings between quantifiers could naturally come into play and explain the contrasts we observe.

So, in my view, the predictions of the transparency theory are too conservative: there is no reason to stick to a uniform treatment of quantifiers in a predictive framework. In fact, this challenge raised by quantified sentences motivated at least in part new systems of presupposition projection: Chemla (2008b) and George (2008). Alternatively, one may argue that the contrasts we see between quantifiers do not participate to the projection problem of presuppositions per se. I briefly discuss this possibility in the following section.

2.2. *Various options*

Universal predictions + weakening mechanisms (difficulty?)

Let us imagine that the universal camp is right: no matter what the quantifier is, presuppositions project universally from the scope of a quantifier. The fact that the universal inference is often rejected for certain quantifiers might be due to differences in the computations involved. For

instance, it is known that downward monotonic environments lead to more difficult inferences (e.g., Geurts, 2003). Thus, one could imagine that when a presupposition trigger appears in a downward monotonic environment, a lazy hearer/speaker does not go through the whole computation process needed for proper presupposition projection and therefore does not arrive to the universal presupposition. However, the experimental data show no difference between the acceptance rate of universal presuppositions triggered from the scope of *more than 3* and *less than 3*. If anything, Schlenker himself defends that the universal presupposition is more robust with *less than 3*, i.e. in the a priori harder downward monotonic environment. (I agree with these introspective judgments although this is typically a case of rather subtle and controversial contrast where an experimental confirmation with naive speakers would be needed).

Hence, if the transparency theory is right and if the lower acceptance rates of the universal inferences are due to some difficulty in the application of the algorithm for some quantifiers but not others, we should be able to pin down the origin of this difficulty. As discussed above, it is very unlikely that it corresponds to the relative difficulty of monotonicity inferences.

Let me mention a solution which would be more specific to the transparency theory. It could be that some quantifiers require inspections of more ''potential second conjuncts'' (the β mentioned in (2)) to get to the full universal prediction. In other words, it is possible that a lazy speaker does not go all the way through the examination of all the potential expressions and therefore fails to reach the universal presupposition. I leave this challenge as an open issue for the transparency theory: what kind of difficulty (or weakening mechanism in general) makes the presupposition weaker than expected in some quantified sentences but not others? I believe that a proper answer to this question would involve building a bridge with our understanding of general reasoning skills and thus requires proper experimental investigations.

Alternatives

There are two main empirical alternatives. First, it could be that the presupposition is the same for every quantified sentences, except that it is not

universal but simply existential, as advocated by Beaver (1994, 2001) for instance. In this type of theories, the universal inferences could be due to pragmatic enrichments of the existential presuppositions and the application of this enrichment may depend on the overall meaning of the original quantified sentence. Such a pragmatic or probabilistic strengthening mechanism remains to be stated explicitly, just as the weakening mechanism alluded to in the previous section.

Finally, we may try to account for the differences between the various quantifiers within a predictive theory of presupposition projection. Chemla (2008b) and George (2008) offer such attempts. The challenge for this last type of approaches is to discover what the exact presuppositions of these sentences are – they might be intermediate between the existential and the universal options given in (7) –, how they vary with the bivalent meaning driven by the quantifier and yet explain why they sometimes support universal inferences.

The situation is both empirically and theoretically intricate. To determine whether the last word belongs to the theory of presupposition projection per se and which of the current approaches is on the right track, we may need to collect new kinds of data. This might require to work beyond the limits of standard linguistic methodology to collect and analyze, e.g., computation times which would inform us about the relative complexity of the relevant processes.

3.   New demands on our theory of presupposition projection

The transparency theory sets up the stage for a new departure in the study of presupposition projection (this includes second inspections of old-fashioned theories, e.g., the revival of Gazdar's system by Klinedinst and Rothschild, 2008). The system proposed in Schlenker (2008a) shows that we can hope for a predictive theory of presupposition projection; it even offers various modules which can be used to match the good old results. Consequently, the expectations for new theories rises in another major aspect: the empirical predictions should be refined together with our understanding of the data themselves. (I illustrated this point with a particular aspect of quantified sentences, although it could be extended to other cases, e.g., disjunctions and connectives in general are discussed at length

in Schlenker, 2008a). Indeed, together with Schlenker's important theoretical progresses, psycholinguistic means now become available to investigate more subtle empirical data, and to draw bridges between linguistic knowledge and more general pragmatic and reasoning abilities.

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Two short notes on Schlenker's theory of presupposition projection*

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The format of *Theoretical Linguistics* is particularly appropriate when one can identify contributions to linguistic theory that – when put in the limelight – are likely to push the field forward in important ways. With this goal in mind, I can't think of a better choice than Schlenker's target article, an article which proposes a completely original outlook on a problem that has troubled researchers for decades and – at least in the eyes of some practitioners – has resisted a satisfactory solution.

My goal for this commentary is very modest, namely to explain what I find remarkable about Schlenker's proposal. I will try to achieve this goal by discussing two of Schlenker's contributions. The first is the identification of a generalization that relates the presupposition of a sentence to what we might call the anti-presupposition of a closely related conjunctive sentence. Although this generalization is predicted by the competing theories that Schlenker considers – namely various versions of dynamic semantics – it suggests a totally new perspective on the problem.

The second contribution that I will discuss pertains to the main tool that Schlenker invokes in order to develop his perspective, namely quantification over possible continuations of a sentence at a particular point of sentence processing. I will point out that this new tool could also be used

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to revive a very old perspective on the problem, one which relies on the principles of various trivalent systems (namely, Strong Kleene or Super-valuation). Quantification over possible continuations can explain how principles of this sort can be modified to yield a predictive theory of pre-supposition projection (along lines investigated in Peters 1979, and Bea-ver and Krahmer 2001). It is not surprising that efforts along these lines have been made in response to Schlenker's paper (by Ben George), and I believe that a comparison of the resulting theory to Schlenker's own pro-posal is bound to yield fruitful results.

1.   On the anti-presupposition of conjunctive sentences

Let C be a context of utterance in which the participants – speaker and addressee(s) – share the belief that a given sentence, S_1, is true. In C, an utterance of the conjunction S_1 *and* S_2 is quite odd.

(1)   Example of a relevant Context: Mary just announced that she is pregnant.
    Mary continues:
    #I am pregnant and I plan to buy many toys for the child I hope to have.

An obvious line of explanation to pursue would be based on the obser-vation that S_1 is redundant given what is already presupposed in C. In other words, one might suggest that conjunctive sentences have an anti-presupposition requirement; they are bad when the presuppositions of the context make one of the conjuncts redundant. But, what is the relevant notion of redundancy?

1.1.   *Global redundancy*

One might start by the suggestion that a sentence S_1 is redundant when it is conjoined with another sentence S_2 in a context C, if the whole con-junction is equivalent given (what is presupposed in) C to S_2; under such circumstances the whole conjunction would contribute exactly the same information that would be contributed by S_2 alone. Hence, S_1 can be

dropped with no loss of information. This constraint would account straightforwardly for the oddness of (1). The participants in the conversation share the presupposition that S_1 is true, and given this presupposition, S_1 can be dropped from the conjunction with no loss of information.

This explanation sounds rather natural and can be generalized to all constructions that embed conjunctive sentences in the following way:

(2)   Global Redundancy Condition
   a.   A sentence that has the conjunction *p and q* as a sub-constituent, $\varphi(p \wedge q)$, is not assertable in C if either p or q is globally redundant in φ given C.
   b.   A conjunct p (resp. q) is globally redundant in $\varphi(p \wedge q)$, if $\varphi(p \wedge q)$ conveys exactly the same information given C as $\varphi(q)$ (resp. $\varphi(p)$)[1,2]

But, there is a direct challenge for this line of explanation which comes from the contrast in (3).

(3)   a.   #Mary is expecting a daughter, and she is pregnant.
   b.   Mary is pregnant, and she is expecting a daughter.

The oddness of (3)a is, of course, accounted for. The second conjunct is entailed by the first conjunct and could thus be dropped (in any context) with no loss of information. But why is the sentence acceptable when the order of the two conjuncts is reversed, (3)b? Shouldn't the sentence be ruled out because the first conjunct is entailed by the second conjunct and is thus redundant?

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[1]   where $\varphi(y)$ is a sloppy way of stating the result of replacing the relevant occurrence of *p and q* in $\varphi(p \wedge q)$ with *y*. I hope that this sloppy notation with which I will continue (mainly to avoid the clutter that will come with precision) doesn't lead to confusion.
[2]   The notion of redundancy can be generalized to non-conjunctive constructions as follows:

A constituent, *x*, is globally redundant in $\varphi(Z)$, where Z has *x* and a distinct constituent *y* as constituents, if $\varphi(Z)$ conveys exactly the same information given C as $\varphi(y)$.

1.2.   *Dynamic triviality*

There is an account of this paradigm based on very famous proposals by Karttunen, Stalnaker, and Heim, which have been pursued and refined in various works that go under the label of *dynamic semantics*. The basic idea is that the role of a sentence is to update presuppositions: i.e., to update a set of beliefs, namely the beliefs that people who participate in a conversation share, sometimes referred to as The Context Set or The Common Ground, henceforth just C. This idea is then accompanied by the additional assumption that the update is dynamic in ways that need to be made precise. Instead of assuming that a sentence updates the common ground C by simply adding the proposition it expresses to C, dynamic semantics views the update procedure for a complex sentence S as consisting of a sequence of intermediate updates determined by the constituent structure of S. Specifically, each lexical item is associated (by its lexical entry) with a particular update rule. For conjunction the rule states that S_1 *and* S_2 updates C in the following fashion: first C is updated by S_1 and then the result of this update is updated by S_2. For other lexical entries there are other lexical rules which I will not repeat here.

The global constraint on redundancy for conjunction can now be replaced with a dynamic constraint against triviality (van der Sandt 1992, with obvious roots in Stalnaker 1978). A conjunct is sometimes licensed even in cases where it could be dropped without loss of information. What is not allowed is for a conjunct (or for any sentential constituent) to be dynamically trivial. In other words, at every step of dynamic update, the set of beliefs that serves as input to the update cannot entail the constituent that updates this set of beliefs.

(4)   Dynamic Triviality Condition: at every step of dynamic update, the set of beliefs that serves as input to the update cannot entail the constituent that updates this set of beliefs.

Thus (1) fails the requirement because the update by S_1 is trivial given the fact that S_1 is part of C even before the utterance takes place, and (3)a fails because the update by S_1 already entails S_2, leading to the result that update by S_2 is trivial. There is no problem with (3)b because none of the updates is trivial. Although S_1 would be trivial if updated after S_2, this is not the way the dynamic update works. The notion of triviality that

dynamic update is sensitive to "sees" only the local environment of update, not the global environment in which a sentence is embedded.

1.3.   *Connection to presupposition projection*

But, as the readers of this volume all know, the dynamic procedure was not stated in order to understand the conditions on the acceptability of conjunctive sentences. A major motivation was to understand the conditions on the acceptability of sentences that carry lexical presuppositions under various embeddings, i.e., in order to solve the problem of presupposition projection. The basic idea was that updating C with a sentence S that carries the lexical presupposition p is acceptable (i.e. defined) only if C entails p, i.e., only if update of C with p is trivial. [In other words, update by S satisfies dynamic-definability only if update by p would violate dynamic-triviality, a point to which we will return.] This ended up deriving core facts about presupposition projection by stating an update procedure for various embedding contexts, i.e., adding statements for various operators, e.g., conditionals, quantifiers, embedding verbs, and the like, that look somewhat similar to what was stated above for conjunction.

To avoid clutter it is common to identify a context C with the set of worlds compatible with the beliefs of the participants in the conversation. The evaluation of a sentence, φ, begins with C, and ends up modifying it so that it includes only worlds compatible with φ. But the update is done in local steps, so that each sentential embedding of φ updates a *local context*, a set of worlds derived by earlier steps of the update. The presuppositions of φ are the requirement imposed on C contributed by the various sentences embedded under φ that have lexical presuppositions. Each such sentence imposes requirements on its local context and the cumulative result of all these requirements is the presupposition of the sentence.

1.4.   *Criticism*

What was achieved, however, crucially depended on rather specific lexical choices that determined the nature of the dynamic update procedure. Of

course, every semantic system must specify the semantic properties of lexical items, but – as pointed out by Soames (1989), Heim (1990),[3] and stressed by Schlenker – in a dynamic system, different lexical choices yield the same truth conditions and differ only in the predictions they make for presupposition projection. Thus, if one cannot justify these choices, one cannot understand why the facts are the way they are. Furthermore, as Schlenker points out, no general statement is offered that would derive the particular lexical choices that one needs to make on a case by case basis. This means that there is no general theory of presupposition projection, only a vocabulary with which one could state different theories. This, of course, leads to an unpleasantly easy state of affairs for the practitioner: when one encounters new lexical items, one appears to be free to define the appropriate update procedure, i.e. the one that would derive the observable facts about presupposition projection.[4]

1.5.   *Schlenker's Generalization*

In response to this state of affairs, Schlenker asks us to meditate on the following prediction that is made under the assumptions of the dynamic framework that we stated above.

(5)   Schlenker's Generalization: Let S_p be a sentence that has p as a lexical presupposition. A sentence, φ, that has S_p as a constituent, $\varphi(S_p)$, is not assertable in a context C if $\varphi(p \wedge S_p)$ is assertable in C.[5]

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[3]   attributing the observation to a letter she received from Mats Rooth in 1986.

[4]   It is, in principle, possible that facts about presupposition projection need to be stipulated in this way, and if this turns out to be the case, it would be a rather sad state of affairs. We will, of course, want to claim that this is not the case, the moment we are able to eliminate the stipulations in favor of a general statement.

[5]   I suspect that, at the end of the day, the generalization should be revised as follows:

(i)   Schlenker's Generalization: Let S_p be a sentence that has p as a lexical presupposition. A sentence, φ, that has S_p as a constituent, $\varphi(S_p)$, is not assertable in a context C if $\varphi(p \wedge S_p)$ satisfies the relevant redundancy condition.

As pointed out to me by Benjamin Spector and Emanuel Chemla, there might be independent factors that make $\varphi(p \wedge S_p)$ unassertable, which are irrelevant for the generalization. See Beaver (this volume).

To understand that the prediction is made, it is sufficient to know that the local context for S_p in $\varphi(S_p)$ is always going to be identical to the local context for p in $\varphi(p \wedge S_p)$.[6] If $\varphi(p \wedge S_p)$ is assertable in C, it follows, by the dynamic triviality condition, that p is not trivial at its local context, but this means, by the dynamic definability condition, that update by S_p is going to fail in this context.

Schlenker invests much effort to establish this generalization, which, on the face of it, could serve to bolster the dynamic framework. However, given the observation made in 1.4., he suggests that we consider another strategy. Suppose that we could come up with a truly predictive statement of the redundancy condition that would tell us when a conjunction of the form $\varphi(p \wedge S_p)$ is assertable. If that was achievable, then the generalization in (5) would give us a predictive theory of presupposition projection.

1.6. *Incremental redundancy*

The global redundancy condition discussed in section 1.1 was truly predictive but wrong. Could it be corrected? The condition stated that a sentence S_1 is redundant when it is conjoined with another sentence S_2 in a context C if the whole conjunction is equivalent given C to S_2. This condition turned out to be too strong in that it ruled out a conjunction of the form S_1 *and* S_2 when S_2 contributes more information than S_1, as in (3)b. So what is the relevant factor that would distinguish (3)b from (1) and (3)a, which were correctly ruled out by the redundancy condition?

Schlenker suggests that the relevant factor is whether or not redundancy can be identified at the point in left to right parsing at which it is encountered. In (1) and (3)a the answer is yes and in (3)b the answer is no. To implement this idea we will define the set of possible continuations for a sentence at a particular point in left to right parsing. We will then say that a constituent can be identified as redundant at the point at which

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6   This, in turn, follows from the format for specifying lexical entries together with the lexical entry for conjunction.

it is encountered if it is redundant in all of the continuations of the sentence at that point.[7] Let φ be a sentence and α a sub-constituent of φ. The set of continuations of φ at point α is the set of sentences that can be derived from φ by replacing constituents that follow α (in the linearization of φ) with alternative constituents.[8] With this at hand, we can define an incremental redundancy condition as follows:

(6)   Incremental Redundancy
  a.   A sentence, $\varphi(p \wedge q)$, is not assertable in C if either p or q is incrementally redundant in φ given C.
  b.   A conjunct p is incrementally redundant in $\varphi(p \wedge q)$ [or $\varphi(q \wedge p)$] if it is globally redundant given C in all $\varphi' \in \mathrm{CONT}(p, \varphi)$.
  c.   A conjunct p (resp. q) is globally redundant in $\varphi(p \wedge q)$, if $\varphi(p \wedge q)$ conveys exactly the same information given C as $\varphi(q)$ (resp. $\varphi(p)$).[9]
  d. $\varphi' \in \mathrm{CONT}(\alpha, \varphi)$ iff
    1. $\varphi' = \varphi$ or
    2. $\exists \Psi \exists \beta'[\Psi = \varphi[\beta/\beta'], \beta$ is pronounced after α in φ, and $\varphi' \in \mathrm{CONT}(\alpha, \Psi)]$[10]

(1) is bad because for every continuation of the sentence at the point of the first conjunct, the first conjunct is redundant, and the same is true for (3)a at the point of the second conjunct. (3)b is OK, although the first

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[7]   Schlenker's definition of continuation involves quantification over the terminal symbols of a syntax that he defines, symbols that include left and right parentheses. I chose to present the same idea with a slightly different implementation, since I think it is conceptually more transparent (see note 8).

  However, as pointed out by Schlenker (p.c.) the two implementations do not derive exactly the same set of continuations (even when differences in notation are factored out). For Schlenker, the set of continuations for the first conjunct in a conjunction all contain the word *and*, whereas for me, they can contain other coordinators. I hope that this difference doesn't affect the overall result.

[8]   This set is plausibly the set of sentences that are consistent with the predicted representation for the sentence when α is encountered, if parsing (i.e. the prediction) is to be successful.

[9]   See note 2.

[10]   Where $\varphi[\beta/\beta']$ is the result of replacing the relevant occurrence of β in φ with β'. (6)d is, of course, just a fancy way of saying that $\varphi' \in \mathrm{CONT}(\alpha, \varphi)$ iff it is obtained from φ by replacing any number of φ-constituents pronounced after alpha.

conjunct is (globally) redundant, since there are continuations that do not make it redundant, hence it is not incrementally redundant.

Schlenker shows that (6) – under certain assumptions – makes exactly the same prediction as dynamic triviality under the original versions of dynamic semantics developed by Heim (1983), extending an earlier proposal by Karttunen 1974. But clearly (6) is a better theory of the assertability of conjunctive sentences than what we get from dynamic semantics, since the latter depends on specific lexical entries that could have been defined to yield different results. And, if this evaluation is correct, the combination of (6) and (5) appears to be a better theory of presupposition projection. Of course, other motivations for dynamic semantics have been proposed over the years, most notably the account it provided for donkey anaphora along the lines of Kamp and Heim. So there is still work to do in comparing the two approaches, work that in my view is likely to push our field forward in important ways (see Schlenker, 2008). Finally, it is important to note that I have presented only one version of Schlenker's proposal, the one that is in factual agreement with the versions of dynamic semantics that he considers. Schlenker also raises the possibility that the condition in (6) needs to be modified in favor of a more global theory, and if he is right, then the facts are quite different from what they have been assumed to be. I will not take a position on whether these more radical speculations might be correct. (See Beaver, this volume, for relevant observations.)

2. A general method of converting global into incremental constraints

Let's focus again on the contrast between (3)a and (3)b.

(3)   a.   #Mary is expecting a daughter, and she is pregnant.
       b.   Mary is pregnant, and she is expecting a daughter.

Both sentences violate the global redundancy condition, but only (3)a is unacceptable. The reason for this is that only for (3)a does global redundancy entail incremental redundancy. To see this, it is sufficient to notice that the constituent that is redundant in (3)a is a final constituent, from which it follows that there are no continuations to consider in computing incremental redundancy (other than the sentence itself). In other words,

final constituents have a property that could be very useful for the researcher: they obliterate the difference between global and incremental constraints.

Suppose we come up with a constraint that restricts the distribution of certain constituents with reference to the global environment in which they occur. Suppose, further, that the constraint is fairly natural, but makes obviously correct predictions only for final constituents. If that is the case, it might be useful to consider incremental versions of the constraint. I think that this strategy might turn out to be useful in other domains, but in the next section I will illustrate how it might be used to revive an old theory of presupposition projection, one that is based on trivalent systems.[11] The theory is the one presented in Peters (1979), revived and further developed in Beaver and Krahmer (2001), and finally recently reformulated in connection to Schlenker's paper, by George (2008). My point, which is already present in George's work, will be that Schlenker's new tool (quantification over continuations) helps us understand the sense in which these theories are truly predictive.

3.   Incremental trivalent systems

In a two valued logic, every proposition is either true or false, whereas in trivalent systems a proposition can have a third value, #. As was suggested by van Fraassen (1966) and many researchers since, one might try to use this property to develop a theory of presupposition projection. Sentences will express trivalent propositions, i.e. objects that at a given point of evaluation can be true, false, or have the third value, #. To derive the fact that certain presuppositions will be required in a context, we would follow Beaver and Krahmer (2001), and introduce an assertability condition (much like the one proposed in Stalnaker (1978) in a bivalent system with partiality). This condition will result in a presuppositional requirement determined by the trivalent proposition that the sentence denotes,

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[11]   Benjamin Spector and I have found this strategy useful in accounting for the distribution of embedded implicatures: among others for the fact that these implicatures cannot be globally redundant when they appear on final constituents (see Singh, in press).

namely the presupposition that the proposition does not receive the third value.

(7)   Assertability Condition for Trivalent Systems
      A sentence S is assertable in C only if $\forall w \in C$ [S is true in w or S is false in w].

Will we end up with a good predictive theory of presupposition projection? The answer depends on whether or not we can develop a predictive trivalent semantics for natural language, one which, together with (7), will derive the appropriate facts about presupposition projection.

When will we say that our trivalent semantics is predictive? In section 1.4., we reviewed the Soames/Heim/Schlenker argument that the dynamic systems are not predictive. The argument was not that lexical items needed to be specified – after all every semantic system needs to provide lexical entries for lexical items. The argument was, rather, that new and very specific statements needed to be attached to lexical items in order to derive the way they project the presuppositions of the elements they combine with.

More specifically, it seems that any system that incorporates presuppositions must contain two types of stipulations, namely the type of stipulations associated with lexical items in a classical system (i.e., a bivalent system with no presupposition) and new lexical stipulations associated with presupposition triggers. What we should demand is that these stipulations, together with a predictive general statement, will suffice to derive the presupposition facts.

So we will start with the unavoidable stipulations – various lexical items will be presupposition triggers; they will have the property that the minimal proposition denoting expressions that they contain will receive the third value, #, under certain circumstances. The problem which we would like to solve in a predictive fashion is the following: given the stipulations of presupposition triggers and classical bivalent stipulations (i.e. classical lexical entries), we would like a general statement that would tell us what trivalent propositions sentences denote.

To appreciate the problem it is useful to start with simple questions that arise when we extend bivalent propositional logic to a trivalent system. Consider what needs to be stipulated in a bivalent lexical entry for a two place propositional function. There are four cases that need to be

considered, since each of the arguments of the function can receive two values (from now on, 1 and 0). Once we move to a trivalent system, there are 9 cases to consider, i.e. 5 cases in addition to those that have been specified for the bivalent system. So the question we would like to answer is whether there is a general statement that will tell us how to extend the bivalent 2×2 matrix to a trivalent 3×3 matrix.

And, of course, there is such a general statement. More accurately, there are various competing statements that yield competing trivalent systems. The question to ask is whether any of these derives the correct facts about presupposition projection. For the case of exposition, I will discuss the Strong Kleene system, but, I think, the same point could be made with reference to Supervaluation.[12]

To understand how things work, it is useful to think of the system as being underlyingly bivalent. What I have in mind is that at every point of evaluation, w, every instance of # should be thought of as either 1 or 0; it's just that we are not told which one it is. If we can determine the truth value of a sentence in w ignoring all instances of #, the sentence will receive that value. So, if one of two conjuncts receives the value 0, we don't need to know the value of the other conjunct to determine the value of the conjunction. We thus derive the following 3×3 matrix for conjunction:

(8) $\land$ 1   0   #
    1   1   0   #
    0   0   0   0
    #   #   0   #

Can a system that uses this trivalent entry derive the correct projection properties? We all know the reason for thinking that it can't, namely that presuppositions do not project symmetrically out of the first and second conjunct:

(9)   a.   France is a monarchy and the king of France is bald.
     b.   #The king of France is bald and France is a monarchy

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[12]   I think that incremental versions of the two systems will turn out to be identical. See Schlenker 2008, theorem 36.

The fact that (9)a has no presuppositions is accounted for straightforwardly. The problem is with (9)b, but let's start with the good case. (9)a is a conjunction of two sentences the first of which contains no presupposition trigger, hence never receives the third value. The second conjunct receives the third value whenever France has no (unique) king, i.e., whenever the first conjunct is false. But whenever one of the conjuncts if false, the whole conjunction is false; the truth value of the other conjunct is just irrelevant. In other words, whenever the presupposition of the second conjunct are not met, the first conjunct will be false and will ensure that the sentence receive a bivalent truth value.

So a sentence of the form $p \wedge S_p$ has no presuppositions, and, more generally, a sentence of the form $S_1 \wedge S_p$, where S_1 has no presuppositions of its own, receives the presupposition that whenever p is false, the truth value of S_p is irrelevant for determining the truth value of the conjunction, i.e. S_1 is false. So (by contraposition), the presupposition of $S_1 \wedge S_p$ is the material implication $S_1 \rightarrow p$, which I take to be correct.[13]

But the problem is that the account makes no reference to ordering, as the symmetric truth table in (8) indicates.[14] The problem generalizes to all connectives, which are assumed to be asymmetric (though Schlenker's discussion of disjunction makes it clear that there are open questions here). For each connective, we get the right result as long as we limit ourselves to cases where a presupposition trigger appears only on the argument of the connective that is pronounced last.

This is reminiscent of our discussion of the contrast in (3) in the previous section. Here, too, we can deal with the problem by introducing an incremental version of the relevant mechanism. Specifically, let's continue to assume that at every point of evaluation, w, every instance of # is thought of as either 1 or 0, and that we are just not told which one it is. But assume that we are allowed to ignore an instance of #, only if we can determine the value of the sentence based on what we've encountered at the point of sentence processing at which # is encountered, i.e., only if we

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[13] I am assuming here that a solution to the proviso problem discussed in Geurts (1996) is within reach (see Beaver 2001, 2006, von Fintel 2006, Heim 2006, Pérez Carballo 2007, Singh 2007).

[14] Given Schlenker's redundancy condition more work needs to be done to show that Strong Kleene is insufficient. See Beaver (this volume) for pertinent discussion.

can determine the value of the sentence ignoring # for every continuation at the point of the constituent that receives the value #.

Under this assumption we will have a simple account of the oddness of (9)b (though see note 12), and more generally of the presuppositions of sentences of the form $S_p \wedge S_1$. Such sentences will receive the value # whenever the presupposition of the first sentence is not met (since there will be continuations for which we won't be able to determine a truth value). Such sentences will, therefore, have p as a presupposition (along with the presupposition that if S_p is true, the presupposition of S_1 must be met).

So we could use this general principle to yield incremental versions of the Strong Kleene truth tables. And what we will get are precisely the truth tables that one finds in Peters (1979). But in order to make the analogy with Schlenker's redundancy condition even more transparent, we might incorporate the principles of incremental Strong Kleene into an assertability condition. Specifically, assume that the system is totally bivalent and that every S_p receives the value 1 iff p&S_p is true (as in Schlenker's setup). We could now introduce the following assertability condition, which will have the same result as Peters trivalent truth tables.[15]

(10)   A sentence, φ, that has S_p as a constituent, $\varphi(S_p)$, is assertable in a context C only if $\forall w \in C$
        ([p is false in w] $\rightarrow S_p$ is incrementally irrelevant for the value of φ in w).

(11)   a.   q, which is a constituent in φ, is globally irrelevant to the value of φ in w iff $\varphi(q)$ receives the same value in w as $\varphi(\neg q)$.
       b.   q, which is a constituent in φ, is incrementally irrelevant to the value of φ in w, iff q is globally irrelevant to the value of φ' in w for every $\varphi' \in \text{CONT}(q, \varphi)$.

We have limited ourselves to a discussion of a language that can be described with a propositional logic. So we clearly don't yet have a theory

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[15]   Though note that one strategy is compositional and the other isn't. George (2008) develops the compositional approach. See Schlenker 2008 where the two types of approaches are compared.

of presupposition projection. In order to turn this sketchy discussion into a theory, we would need, at the very least, to define relevance for constituents that contain free variables (or for functions from various types of individuals to truth values). I imagine that this will require a four place relation of relevance (q is relevant to the value of φ in w given a sequence of individuals), but I haven't been able to work this out.[16] Still, I hope that the strategy is clear. I will stop here and mention again this extremely interesting new paper by Ben George.

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Why Be Articulate? Two ways to look at the Transparency Theory[1]

EMIEL KRAHMER[2]

Introduction

In his interesting paper, Schlenker proposes ''a pragmatic theory of pre-supposition projection'' (which he calls Transparency Theory), based on two simple principles. One of these is the well-known Gricean maxim of manner *Be Brief*, the other is a new principle, dubbed *Be Articulate*. In a thoughtful and detailed analysis, Schlenker shows that the interplay between these two principles can account for a wide range of traditional presupposition projection phenomena. There are two ways in which this new theory can be appreciated; one way to look at it is as a principled derivation of Heim's (1983) influential theory of presupposition projection, the other as a new theory of projection phenomena in natural language. In the remainder of this short note I want to discuss and comment on both of them.

One way

Schlenker shows that the incremental Transparency Theory makes essentially the same predictions as Heim's (1983) approach. The main difference is that while the Transparency Theory is based solely on the relative ranking of two simple principles, Heim's approach requires the definition

of an entirely new semantics. According to Schlenker, Heim's semantic approach lacks "explanatory depth" since it crucially relies on the somewhat arbitrary dynamic interpretations of the various logical connectives. This makes the incremental version of the Transparency Theory an interesting addition to the (substantial) literature on presupposition projection, which may be likened to a common practice in mathematics, where mathematicians happily publish new proofs of established theorems, simply because the new proof is simpler, more elegant or offers some new insight. In this case, Schlenker proves that the predictions that fall out of Heim's Context Change Potentials can (in essence) also be derived from his two "axioms".

Naturally, the strength of this result rests on how convincing the "axioms" are. One of these (*Be Brief*) is convincing enough (although the actual formulation might have surprised Grice), but the other one (*Be Articulate*) raises a number of basic questions. First of all, what is the status of this principle? Schlenker takes it as primitive for now, but suggests that it may actually be derived from Grice's *Be Orderly*. However, no suggestions are offered on how this derivation could be achieved, and it is difficult to imagine what such a derivation might look like. Second, while there is clear independent evidence for *Be Brief*, it is unclear whether such independent evidence exists for *Be Articulate*, or, for that matter, for the claim that it should be ranked lower than *Be Brief*. Arguably, a theory invoking a new maxim solely to account for presupposition projection has some issues with "explanatory depth" as well. Third, and somewhat related to the previous point, to what extent is *Be Articulate* like other maxims? For instance, does a violation trigger an implicature, just like flouting one of Grice's maxims does? It is well known that violations of *Be Brief* as in, say, the following example from Levinson (1983: 112), do indeed trigger such implications (in this case that Miss Singer actually sings pretty bad).

(1)   Miss Singer produced a series of sounds corresponding closely to the score of an aria from *Rigoletto*.

It is unclear whether the same would hold for a violation of *Be Articulate*.

Clearly, Schlenker's position would be considerably strengthened if independent evidence for *Be Articulate* and for its relative ranking would be provided, and if *Be Articulate* could indeed be shown to be a real maxim

or could be derived from existing ones. In any case, even though it will be interesting to see where this will go, these are comparative details, and do not diminish the general attractiveness of the incremental Transparency Theory. If Stalnaker's account has "the ring and simplicity of truth", the same applies to Schlenker's.

The other way

There is also another way to look at Schlenker's theory, namely as a new account of presupposition projection phenomena in natural language. Such a theory should first and foremost be judged on its predictions, much as is the case with theories in most other fields of science. A theory may have the ring and simplicity of truth, but if it makes incorrect predictions it is in serious trouble. Even though I take the previous sentence to be self-evident, there are difficulties in applying this truism to the theoretical study of meaning, and others (e.g., Stokhof 2002) have far more interesting things to say about this than I. Below, I merely want to discuss how this perspective applies to Schlenker's Transparency Theory, and here things get slightly complicated. To begin with, Schlenker does not merely propose a new theory of presupposition projection, he actually proposes two. As we have seen, the first (Incremental Transparency) is proven to be (essentially) identical to Heim's theory, and thus makes (essentially) the same predictions concerning presupposition projection. At first the reader might think that there are subtle differences between the two theories, opening the space for an emprical comparison. But it turns out that the differences have to do with technical details. The second theory (Symmetric Transparency) does make different prediction than Heim's theory; in many cases, these predictions appear to be worse than those of Heim's, while in some other cases they seem to be better. The natural question is: which theory is the best one? Schlenker's preferred solution is to adopt both theories, but with different strengths. His basic idea is that a sentence is "less sharply excluded" when it violates the symmetric version of *Be Brief* than when it violates both the symmetric and the incremental versions.

   With this proposal Schlenker's proposal joins a long list of what we might call "overgenerate-and-rank" theories of presupposition. Van der

Sandt (1992)'s theory of presuppositions-as-anaphors is a prime example. According to van der Sandt, a presupposition-trigger can be "resolved" in a number of different ways (this is the overgeneration part). Some of the possible resolutions may be ruled out on independent grounds (e.g., because the result would violate a consistency or an informativity constraint), and the resulting potential resolutions are ranked based on principles such as "prefer binding over accommodation" and "prefer nearby bindings over longer distance ones". The proposal in Beaver & Krahmer (2001) is another example, albeit in a completely different setting: after showing that no single set of partial logical connectives can account for the basic projection data, they propose to associate each sentence with an ordered set of logical representations, filtered by similar consistency and informativity constraints.

There are two general problems that these kinds of theories have to face. First of all, it is generally difficult to falsify them. An alleged counter-example can always be ruled out by invoking some new independent requirement that was not taken into account so far. Thus, it is important to be fully explicit about the theory and its predictions, before these predictions can be tested against real, natural language data. Which brings us to a second, more general and arguably more serious problem: what are the data exactly? In this particular case, the data are acceptability judgements about example sentences with presuppositions that may or may not be projected. These examples are typically constructed to show why one theory might be better or worse than another, so it is only natural that the resulting sentences tend to be complex and occasionally slightly odd. Schlenker turns out to have rather delicate intuitions about his examples; concerning one sentence he writes "I don't find it entirely impossible to understand the examples (...) without a presupposition", elsewhere a sentence is judged as "slightly more acceptable" than another.

Of course, this is not a new problem, nor one that only applies to the Transparency Theory; subtle judgements are rife in all areas of theoretical linguistics. Yet, the status of such judgments can be unclear. It is well-known, for instance, that syntacticians' intuitions about the grammaticality of example sentences constructed to support their own theory, or to falsify someone else's, need not coincide with the judgements of other language users (e.g., Manning & Schütze 1999:10). Which does not mean

that I disagree with Schlenker's intuitions (sometimes I do, sometimes I don't, but that is besides the point). It does mean that there is no general, validated body of data against which to evaluate different theories, so that it is ultimately difficult to evaluate the Transparency Theory as a theory of natural language presupposition projection. The fact that the theory makes graded predictions (sentence A "less sharply excluded" than sentence B) is a serious, additional complication, since such intuitions are likely to be generally less clear cut.

What next?

There are by now many theories of presupposition projection, and many solid, well-argued for intuitions about what these theories should predict (albeit sometimes incompatible ones). However, it is a somewhat surprising fact that there is so little actual data. With a few notable exceptions (e.g., Chemla 2007), there are no corpus studies looking for naturally occurring examples, no judgment studies validating different intuitions, no on line measurements (e.g., eye tracking, ERP or reaction time measurements) to test predictions about how language users process sentences with presuppositions. In fact, even for what is arguably one of the most basic issues in the entire presupposition literature (do false presuppositions in simple sentences lead to falsity, in line with Russell 1905, or to some kind of undefinedness, as Strawson 1950 would claim) there have been no such studies. There has been a lively debate, to be sure, with strong rhetorical advocates for the various positions, but it is highly unlikely that such a debate can be settled through argumentation and intuitions. As an aside, it is interesting to note that Heim (1983) and Schlenker's incremental Transparency Theory seem to make slightly different predictions about examples with false presuppositions such as Schlenker's (2).

(2)   The king of Moldavia is powerful.

Heim's theory predicts it is semantically marked, due to presupposition failure, while the Transparency Theory predicts it is semantically false and pragmatically marked (due to a violation of *Be Articulate*). It seems that these are predictions that are experimentally testable. In general, it will be difficult to distill testable predictions from the various theories of

presupposition projection, but for the advancement of the field it seems essential to combine theory building with careful experimentation. The first step, experimental judgement studies (where selected sentences are rated on acceptability by a group of participants), should be easy to set-up, and can offer valuable input for both further theory development and experimental studies.

Conclusion

Schlenker's Transparency Theory can be looked at in two different ways. On the one hand, the incremental Transparency Theory offers what is arguably a simpler and more principled counterpart to Heim's (1983) dynamic semantic theory, only invoking two basic principles: *Be Brief* and *Be Articulate*. The latter principle does raise a number of questions (what is the status of this new principle? is there any independent evidence for it? how does it relate to the well-known Gricean maxims?) and it will be interesting to see how Schlenker addresses these. On the other hand, Schlenker, in the second part of his paper, also proposes a new theory of presupposition projection in natural language, which combines both the incremental and symmetric Transparency Theories and yields subtle, graded predictions. Evaluating this perspective is more difficult, primarily due to a lack of empirical data. For the advancement of the field, it seems important that theory development and empirical data collection should go hand in hand. As things stand, the field is strong in the former and weak in latter area, and this is a situation that ultimately is undesirable. With a little care, it should be perfectly possible to obtain relevant empirical data and Schlenker's rich paper offers various concrete starting points for such empirical investigations.

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Transparency Theory and its dynamic alternatives: Commentary on ''Be Articulate''

DANIEL ROTHSCHILD

''Be Articulate: A Pragmatic Theory of Presupposition Projection'' is a remarkable paper in at least two respects:

First, it is the only broadly Gricean treatment of presuppositions that generates precise and accurate predictions about the pattern of presupposition projection. Schlenker proposes that presuppositions arise as a result of a pragmatic prohibition against using one short construction to express two independent meanings. This basic idea is quite an old one.[1] But no one has ever elaborated this pragmatic story in a way that yields a systematic theory of presupposition projection. Indeed, for many, the fact that pragmatic approaches to presupposition did not easily account for a wide range of projection behavior (most previous accounts contented themselves by treating projection out of negation) was a reason to be skeptical of such pragmatic approaches. Schlenker's work puts this worry about Gricean accounts to rest.

Second, Schlenker has shown how one can give an account of presupposition projection without stipulating properties of the logical connectives that not do not follow from their truth-conditional meaning along with other *general* features of the account. As far as I know, no previous, empirically adequate theory accomplished this.

In this short commentary I will argue for two main points:

The first point relates to the second aspect of Schlenker's theory that I mentioned. Schlenker argues that Transparency Theory has an explanatory advantage over dynamic semantics because of its non-stipulative treatment of the different logical connectives. However, I argue that

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[1] See, for instance, Stalnaker (1974) and Grice (1981).

dynamic semantics can, in a very natural way, be modified to yield an explanatory theory that stipulates nothing about each binary connective besides its truth-conditions. So Transparency Theory does not stand alone in being able to make accurate predictions about presupposition projection without connective-specific stipulations.[2] I am not all confident that dynamic approaches to presupposition projection are correct, but I am sure that they need not be stipulative in the way in which the theory of Heim (1983) is.[3]

Second, I will argue that Schlenker is right to give both symmetric and asymmetric theories of presupposition projection. However, I will point out that Schlenker's symmetric theory of presupposition projection suffers from what is likely to be a significant empirical flaw that dynamic semantics does not have.

1. Non-stipulative dynamic semantics

The central idea of dynamic semantics is that sentences are associated with instructions to alter the context that are only defined in some contexts (where contexts are common grounds in Stalnaker's sense). If we took the context in which each presuppositional expression occurs just to be the context in which the sentence containing it is uttered, we would have a theory that predicts a perfectly uniform pattern of presupposition projection: all presuppositions of any part of any sentence would be inherited by the whole. Since this is not what we find empirically we need, rather, to assume a notion of *local context* that varies within a single sentence. The local context of the consequent of a conditional, for instance, will need to be a context that already incorporates the antecedent.

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[2] In fact, since Schlenker's work was first made publicly available at least two other theories that can predict the basic pattern of presupposition projection without connective-specific stipulations have emerged: Chemla (2008) treats presuppositions as a form of scalar implicature, while George (2008) revives the strong Kleene truth-tables to predict the basic pattern of presupposition projection.

[3] To my knowledge, Schlenker is right in suggesting that all subsequent work in the dynamic tradition has also imported stipulations akin to Heim's to predict the pattern of presupposition projection.

Schlenker criticizes this program by setting up a dilemma: either we try to motivate the notion of local context by appeal to pragmatic principles governing belief updates in the course of processing utterances or we capture it using some sort of non-standard semantics. I think Schlenker is right in his claim that the first path is hopeless: while it is somewhat plausible to thinking that people update beliefs sequentially when they encounter an unembedded conjunction, there is no obvious algorithm of belief update mid-sentence for compound constructions generally.

This leaves us with having to give a semantic account of local context. On the semantic view of local context there is a compositional semantics that has as its basic operations context updates. Formally, instead of characterizing the truth-conditions of sentences, we characterize their effect on common grounds. So for any formula A we are no longer interested in which worlds A is true in, but rather what the effect of A is on different common grounds (following Schlenker's nomenclature we can represent the effect of A on the common ground C as $C[A]$). Atomic sentences, thus, are context change potentials (CCPs) that are only defined over some contexts, and binary operators take two CCPs and yield a new one. Heim gives a semantics for this sort of language in such a way that the basic facts about presupposition projection neatly fall out. Nonetheless, Schlenker – following Soames (1989), and Heim (1990) herself – criticizes her account for requiring stipulations specific to each connective that are not predictable from their truth-conditional meaning. For example: Heim posits that the meaning of $C[A \wedge B]$ is $C[B][A]$ (in words: updating the common ground, C, with $A \wedge B$ is equivalent to first updating C with A and then updating the resulting common ground with B). Her account accurately predicts that a presupposition in the second conjunct will not project out, if it is satisfied by the first conjunct. But another update procedure for conjunction: $C[B][A]$ would capture truth-conditional conjunction equally well without making this prediction about presupposition projection.[4] Of course, it is open to the proponent of dynamic semantics to accept that it is a fact of human psychology that the connectives

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[4]   Note that while Heim's rule might seem more intuitive for conjunction, the necessary rules to cover the basic facts about disjunction are much less intuitive. Also, an update procedure for conjunction doesn't have to be "backwards" not to make the right predictions: consider $C[A] \wedge C[B]$.

are as they are in Heim's semantics, but, all else equal, an account with-
out stipulations that go beyond the truth-conditions for each connective
would be simpler (and until we know the facts about human psychology
we should strive for simplicity).

We could try to remove the stipulations specific to each connective by
adding general syntactic constraints on how the update procedures for
connectives are formulated.[5] However, such constraints would need to
be motivated. A preferable alternative, I suggest, is to liberalize Heim's
theory. Rather than stipulating update procedures or templates for com-
plex CCPs, we allow any update procedure that is defined in a given con-
text to be used. To realize this idea we need a language with two things:
a syntactic specification of what counts as an update procedure generally
(which we will try to make as loose as possible) and a definition of when a
given update procedure is acceptable for a given connective.

I assume that corresponding to every proposition (i.e. set of possible
worlds) there is an atomic sentence, X, in a language, L, such that X is
true only in the worlds contained in the proposition. Common grounds,
then, can be represented as sentences in L. We also include a class of
complex CCPs in L. Syntactically a CCP attaches to a sentence to form
a new sentence: if C is a sentence and A is a CCP then $C[A]$ is a sentence
in L. Semantically we assume, for atomic CCPs, that $C[A]$ is only defined
if C entails some sentence $\underline{A}$. We also assume that there is some sentence
A' such that, if $C[A]$ is defined, then $C[A]$ is true in w iff $C \wedge A'$ is true in
w.[6] Now we give a general syntactic notion of an update procedure:

Syntactic Form of Update Procedure   A sentence in L is an update proce-
dure for sentence C, and CCPs A and B iff it is an update procedure ac-
cording to these recursive rules:

1. C is an update procedure for A, B, and C
2. if X and Y are update procedures for A, B, and, C, then so are
    $X \wedge Y$, $X \vee Y$, and, $\neg X$
3. if X is an update procedure for A, B, and C, then so are $X[A]$ and
    $X[B]$

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[5] Schlenker suggests this move.
[6] This constraint captures the idea CCPS are like assertions in the way they change the
    common ground.

An update procedure for A, B, and C, is defined if and only if every instance of $[A]$ or $[B]$ in it is defined. We now need to specify which update procedures can work for which connectives:

Connectives and Update Procedures   An update procedure, U, for A, B and C, is *acceptable* for a connective $*$ (where $*$ is any truth-functional connective) iff U is such that for all sentences and A', B', and C', if every instance of $X[A]$ (where X is any sentence) in U is replaced by $(X \wedge A')$ and every instance of $X[B]$ in U by $(X \wedge B')$ and every instance of C by C' the resulting sentence is equivalent to $C' \wedge (A' * B')$.

Instead of Heim's single update procedure for each binary formula $A * B$, we now have an infinite set of acceptable update procedures which are equivalent, in the bivalent case, to conjoining the common ground with $A * B$. We will say that $C[A * B]$ is defined iff there is some update procedure for A, B, and C, acceptable for $*$ that is defined. If defined, $C[A * B]$ is true in w iff any defined update procedure for A, B, and C that is acceptable for $*$ is true in w. This gives us a recursive semantics for complex CCPs. More picturesquely, we are assuming a dynamic system in which the hearer can *choose* which update procedure for a connective to use from among all those which are defined in the context.

This system yields specific predictions about how complex expressions inherit the presuppositions of their parts. Here are the inheritance rules yielded:

- $C[\neg A]$ is defined iff $C[A]$ is defined.
- $C[A \wedge B]$ is defined iff $C[A][B]$ or $C[B][A]$ is defined.
- $C[A \vee B]$ is defined iff $(C \wedge \neg C[A])[B]$ or $(C \wedge \neg C[B])[A]$ is defined.[7]

This system, of course, does not yet predict Heim's fully asymmetric rules for presupposition projection. In other words, this system pays no attention to order with symmetric operators such as $\vee$ and $\wedge$, whereas Heim's system gives rules that differ for $A \wedge B$ and $B \wedge A$. Luckily, if you want to derive Heim's exact, asymmetric CCPs, one more feature can be added to this liberalized dynamic system that will do this. It is possible to give an *incremental* version of the kind of dynamic semantics sketched above

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[7]   Rothschild (2008) proves this result.

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(akin to Incremental Transparency Theory). To do this we simply say that any complex CCP S is incrementally acceptable in C iff for any for any starting string of S, α, and and any string β such that a) the only atomic CCPs in β are such that they are always defined and b) $\alpha\beta$, the concatenation of α and β, is a well-formed complex CCP, $C[\alpha\beta]$ is defined. This incremental rule will turn the symmetric rules above into asymmetric ones equivalent to standard dynamic semantics (as described in "Be Articulate").[8]

The upshot is that Schlenker's semantic horn is not fatal for dynamic semantics; rather Heim's basic proposal just needs to be made a bit more flexible and asymmetries need to be treated in a uniform fashion, rather than stipulated for each connective.[9]

2. Capturing symmetries in presupposition projection

Despite a decided preference in the literature for asymmetric theories of presupposition projection, there are many cases which can only be handled by a symmetric theory. Usually the cases are slightly more complex than the very standard cases, but I think the judgments are relatively clear.[10] Here are two examples of sentences that do not seem to trigger any presupposition (more examples are in "Be Articulate," section 3):

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[8] Rothschild (2008) gives a proof of this claim.

[9] I have not treated quantification here, but I believe the system can be adapted to handle quantified presuppositions in a manner similar to Heim (1983).

[10] The reason why we need to look at complex cases is there may be be independent pragmatic principles interfering with our judgments in many simple cases. For example, the reason $A \wedge \underline{a}$ is unacceptable may be that there is a prohibition on saying $A \wedge B$ if A entails B (but not vice versa). So, as Schlenker notes, the following sort of sentence is odd:

(a) John is a practicing, accredited doctor and he has a medical degree.

Whereas the reverse order is more normal:

(b) John has a medical degree and he is a practicing, accredited doctor.

Of course, Schlenker thinks such pragmatic facts are themselves what explain presupposition projection. But the existence of symmetric presupposition phenomenon casts some doubt on this claim. Nonetheless, Schlenker argues that there are persistent asymmetries in presupposition projection that cannot be explained by simple constraints on entailing conjuncts and the like.

(1)   If John doesn't know it's raining and it is raining, then John will be surprised when he walks outside.

(2)   It's unlikely that John still smokes, but he used to smoke heavily.

Both of these cases require a symmetric account of presupposition projection (or, at least, the standard asymmetric theories like Heim's make the wrong predictions). Given the existence of examples like (1) and (2), we should be interested in the properties of different symmetric systems for handling presupposition projection.

Schlenker himself can and does give a version of Transparency Theory that captures the symmetric aspect of presupposition projection. This is his non-incremental, symmetric version of Transparency Theory (described in section 3 of ''Be Articulate''). In this symmetric version, the transparency of a presupposition is checked not with respect to every continuation (as in the incremental version) but with respect to the actual continuation of the sentence. This theory accounts for the apparent symmetric cancellation in (1) and (2). On the liberalized dynamic semantics these readings are accounted for with the non-incremental version.

There is one simple respect in which the non-incremental version of dynamic semantics seems preferable to Schlenker's Symmetric Transparency Theory. Symmetric Transparency Theory allows two of the same presuppositions to cancel each other in various instances, but no version of dynamic semantics does.[11] Thus, on Symmetric Transparency Theory the following sentence should have no presuppositions:

(3)   Either John doesn't still smoke or his doctor doesn't know that he used to smoke.

The presupposition of either clause (that John used to smoke) is transparent in its clause in Symmetric Transparency Theory and so the entire sentence has no presupposition. But on the dynamic theory I have sketched this sentence is defined in a context c only if c entails that John used to smoke. I assume that the judgments for this sort of case favor the dynamic theory. So, to the extent that we need something like a symmetric

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[11]   Schlenker (2008, footnote 13 and appendix no. 39) notes the more general feature of Transparency Theory that this is an instance of.

theory to handle a range of judgments, there is at least one advantage to the non-incremental version of the dynamic account outlined here.[12] I assume Schlenker's symmetric account can be modified to handle these cases, but I do not know exactly how the modification will go or what the overall effect on the theoretical appeal of the theory will be.

In any case, there can be no doubt about the importance of Schlenker's work or the extent to which it has galvanized the theory of presupposition projection.[13]

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[12]   This advantage is shared by some trivalent accounts such as the Strong Kleene account, discussed by, e.g., Beaver (1997) and George (2008).

[13]   Many thanks to Be Birchall, Emmanuel Chemla, Haim Gaifman, Nathan Klinedinst and Philippe Schlenker for discussion.

Projection and pragmatics: Two comments

ULI SAUERLAND

Schlenker's paper (Schlenker, 2008a) is part of a very interesting research project driven by himself (Schlenker, 2007a,b, 2008b), but involving others too (Chemla, 2007, 2008; George, 2008). The basic question of this paper is how presupposition projection can be derived from general principles – an explanatory account of presupposition projection. Schlenker's work has placed this question on the agenda and the present paper presents one way of answering this question. It assumes that certain parts of clause or predicate meanings are distinguished from the rest: the preconditions marked by underlining as in 'pp''. The account is furthermore based on the interaction of two general, antagonistic pragmatic principles: *Be Articulate*, which favors 'p and pp'' over 'pp'' and *Be Brief*, which conversely prefers 'pp'' over 'p and pp'', but only if p is semantically idle. The interaction of the two principles derives that preconditions must be inferable from the common ground or, when embedded in a complex sentence, must be *transparent* in at least on the two ways defined in Schlenker's paper.

Schlenker's work provides an explanatory account of presupposition projection. This is significant progress: As far as I know, none of the prior work on presuppositions has accomplished something similar: Dynamic semantics is the most well-known existing theory of presuppositions. But as Schlenker discusses, the existing account of presupposition projection in dynamic semantics is not explanatory, but rather descriptive: The projection properties of each lexical items are stated individually. The empirical predictions may be the same – Schlenker (2007a) shows formal equivalence of his approach with some proposals in dynamic semantics –, but Schlenker's theory is more explanatory than the existing dynamic accounts of presupposition projection.

Schlenker's current paper raises several interesting issues and questions. The one that has attracted the most attention in the papers I mentioned above is the projection behavior of quantifiers. It would be pointless if I were to address this issue on this occasion since I would need to go beyond the present paper. I only remark on two issues that are not as central to ongoing discussions in the literature: the tension between bivalence and domains of functions and the local/global debate.

1.   Bivalence

Most semanticists (and not just them) assume that functions a basic building blocks of sentence meanings: They assume that some word meanings can captured by functions that take arguments and result in a phrase meaning (see Heim and Kratzer 1998 and other textbooks). Functions are mathematical objects that have a domain and assign to each element of their domain a value. A function-based semantics is by its nature trivalent – a truth value function can be true for some values and false for others, but there also are those values that are not in the domain of the function at all (cf. George 2008). Can trivalence be avoided, but the function-based account still be maintained?

Consider two phenomena that lend themselves easily to an analysis in terms of domains. One are sortal distinctions as, for example, 1) *drink* selecting for liquid objects, while *eat* selects for solids, and 2) *extinct* selecting for natural species. Such conditions seems to behave like other presuppositions with respect to projection, as (1) illustrate.

(1)   a.   If my water was frozen, I would be eating it.
      b.   I name this species "Sauosaurus" and surmise that the Sauosaurus is extinct.

Consider for example *eat*. On the function-based trivalent approach *eat* is defined as a function with that maps solid entities x to the property $\lambda y \, . \, y$ eats x. On the bivalent approach, I assume Schlenker would extend his approach to transitive verbs by viewing them as second order predicates of type $\langle e, \langle e, t \rangle \rangle$ derived from binary predicates. Then, *eat* is captured as the conjunction of two functions f and f' which each map all entities to a property. f is the precondition and maps x to the universally true property

if x is solid, and to the universally false property otherwise. f' maps solid entities x to the property $\lambda y \, . \, y$ eats x and for all other x can be mapped to the universal property. However, as far as I can see, f' is actually underdetermined by Schlenker's proposal: Even if, for all x and y, the truth of $f'(x)(y)$ entailed $f(x)(y)$, *Be Articulate* would prefer f and $\underline{ff'}$ over $\underline{ff'}$. Given the simplicity of first account, the domain-restricted function, the complexity and underspecification of the bivalent account is aesthetically less pleasing.

The second case is the definite article. The Fregean lexical entry for the definite article is of type $\langle\langle e, t\rangle, e\rangle$: It takes it to be a function from the domain of non-empty properties to the domain of individuals. If morphological number is taken into account there may be further restrictions (Sauerland 2003), but they are not important here. Important is that, on an account using type $\langle\langle e, t\rangle, e\rangle$, the definite article is not defined for empty properties. Most semanticists believe that there are good reasons to prefer this kind of account over the quantificational account of Russell (1905) (see for instance Heim's (1991) for discussion). But, a bivalent account of the definite article using type $\langle\langle e, t\rangle, e\rangle$ must define it for the full domain of properties of type $\langle e, t\rangle$ including the empty property. What Schlenker (2007b) suggests to add a special individual # to denote failure of reference to the domain of individual. But is this really a different solution? While it is technically different from introducing a third truth value, it accomplishes this by shifting the special value into the individual domain.

2. Local/global

Schlenker's pragmatic account derives presupposition projection from two pragmatic maxims that are in the spirit of Gricean maxims. Schlenker applies the maxims *globally* – i.e. always at the root level. For other Gricean maxims, there is a question whether they cannot also apply *locally* – i.e. to various embedded propositions. In fact there is a lively debate on this issue with Chierchia (2004), Fox (2007) and many others advocating the non-Gricean, local view and Sauerland (2004), Russell (2006a), and others defending the Gricean view.

Local application of Schlenker's maxims is incompatible with the claim that there are no local contexts of evaluation that differ from the global

context. In other words, if we were to apply Schlenker's maxims locally, we would need to assume local contexts in addition to the global one. The predictions of such a system would depend on how the local and global contexts are related to one another.

One candidate for embedded application of maxims are embedded imperatives as in (2) and (3) (see e.g. Schwager 2005; Russell 2006b). In both examples, presupposition projection behaves as with non-imperatives. This result shows that presupposition projection, if (2) or (3) do make use of embedded speech act operator that also trigger Gricean maxim application, we still would not want to say anything novel about presupposition projection here. The account sketched just above, which introduced local contexts to be able to apply Schlenker's maxims locally, would not predict this behavior.

(2)   Either don't buy a dog or feed it regularly.

(3)   If you want a healthy dog, feed it regularly.

Now consider the second candidate for embedded maxim application. Since Cohen (1971) examples similar to (4) have been discussed. The examples should be considered in a context where one person's car has been damaged by another car, which he suspects to be John. Therefore, he and his friend go off to check whether there is any damage on John's car, but they don't see any. In this situation, (4) states that John is innocent if he has only one car. Since the conditional can be interpreted as *if John has only on car*, this may require implicature application to apply in the conditional clause.

(4)   If John has one car, which is without blemish, his car cannot have hit yours.

But we observe again no difference between the conditional in (4) and other cases of presuppposition.

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When satisfaction is not enough*

Comments on Schlenker's '*Be articulate.*
A pragmatic theory of presupposition projection'

ROB VAN DER SANDT

1. Prelude

Philippe Schlenker has written a provocative and intriguing paper, firmly taking sides with E-type proponents in their attack on dynamic semantics. After stating that an E-type approach to donkey-anaphora is essentially correct, he boldly claims that the fortune of dynamic semantics now largely rests on the second motivation for dynamic semantics, the analysis of presupposition. After a general criticism pertaining to the 'explanatory adequacy' of Heim's account he returns to a line of theorizing that was prevalent in the seventies. The name of this revival is Transparency Theory, an account which aims to capture the Karttunen/Heim predictions (and is for this reason taken to be 'descriptively adequate'), does so in a static fashion and is thus argued to supersede the current dynamic accounts (both the Heim and the DRT-based versions) in being 'explanatory adequate'.

2. The unsatisfied analyst

Schlenker's theory correctly mimics Karttunen's (1974) and Heim's (1983) account (the satisfaction theory for short) in predicting that (1a) through (1c) presuppose that France has a king.

(1) a.   The king of France is bald.
     b.   The king of France is not bald.
     c.   If the king of France is bald, he wears a wig.

He also correctly predicts that none of (2a) through (2d) presupposes that France has a king.

(2) a.   France has a king and the king of France is bald.
     b.   It is not true that France has a king and the king of France is bald.
     c.   If France has a king, the king of France is bald.[1]

Furthermore, he manages to do so without making any stipulations with respect to the heritage properties of the logical connectives.

   The major virtue of the satisfaction theory is its elegance and simplicity. However, as is well known from the literature, it is beset by a host of empirical problems. In unmodified form its predictions are too strong.[2]

(3) a.   It is not the case that the king of France is bald: France is a republic.
     b.   Either the king of France or the president of France opened the exhibition.
     c.   It is possible that France has no king but it is also possible that the king of France is in exile.
     d.   If I realize later that I have not told the truth, I will confess it to everyone.

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[1] The predictions are actually slightly stronger. If the antecedent of a conditional entails a presupposition of the consequent clause (or the first conjunct of a conjunction a presupposition of the second) the presupposition of the full sentence trivializes to a tautology. Heim (1983) explicitly defends this and takes the fact that Gazdar predicts preservation of the presupposition as a decisive counterexample. I disagree. Consider

   (i)   If John has grandchildren, his children will be happy.

   (ii) They always wanted to have offspring.

   The first sentence has a presupposing reading. Note that the pronoun in (ii) picks up the referent for the children that makes after processing the first sentence is accommodated in the main context. I add that (i) also has a non-presupposing reading. A theory of presupposition should thus allow both interpretation possibilities.

[2] The reader may consult Gazdar's discussion (1979) for a thorough overview.

The basic rules wrongly predict substantial presuppositions for each of (3a) through (3d).

In other cases the predictions are too weak.

(4) a. If baldness is hereditary, the king of France is bald.
     b. If baldness is hereditary and the king of France is bald, he wears a wig.
     c. Either baldness is not hereditary or the king of France wears a wig.
     d. It is possible that baldness is hereditary and that the king of France is bald.

The prediction is that none of (4a) through (4c) presupposes that France has a king but instead that they have the conditionalized (5) as their presupposition.[3]

(5) If baldness is hereditary, there is a king of France.

When we consider multiple embeddings the situation tends to get worse at each further embedding. Thus (6a) is predicted to presuppose (6b).

(6) a. If baldness is not hereditary, then Pfizer will develop a cure and the king of France will sell his wig.
     b. If baldness is not hereditary, then if Pfizer will develop a cure, there is a king of France.

The problem is quite general, has become known as the proviso problem and is extensively discussed in Geurts (1999).

Satisfaction theorists have answers to both problems. With respect to the examples under (3) they invoke a mechanism of local (or more general non-global) accommodation. Since their theory relies on (a succession of) intermediate contexts this is a viable option.[4] For Schlenker's theory which does not allow for such things as intermediate contexts, it is not.

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[3] Note that we may continue each of (4a) through (4d) with e.g. 'He is a proud man'. The possibility of pronominal uptake is hard to explain unless the incoming context contains a referent for the king of France. Cf. footnote 1.

[4] I should remark that the way Heim implements this, forces us to tinker with the update rules which in fact comes down to postulating a semantic ambiguity in the connectives.

Schlenker claims however that the effects can be 'emulated' within the transparancy framework:

> [...] under duress (e.g. to avoid a very bad conversational outcome, such as the utterance of a contradiction or a triviality), one may assume that the speaker did not obey *Be articulate*.

In his bivalent system this has the effect of leaving us with the 'unadorned bivalent meaning' i.e. no presupposition whatsoever. I don't see how this can count as an emulation *within* Transparency Theory. It strikes me more as the theory-external claim that in the face of threatening counter-examples the theory does not apply.[5]

As to the second problem I remark that for a satisfaction theorist conditional weakening is in a sense natural. Heim for example takes presuppositions to be the (minimal) conditions for the update to be defined. But, so Beaver (2001) adds, the presupposition computed need not be the material that is to be accommodated. In order to account for the intuitive inferences which arise from the material that is accommodated in the main context we may invoke a pragmatic strengthening mechanism to obtain the stronger predictions.[6] Such a strategy may be open to a proponent of a semantic account of presupposition. It is not a reasonable option for Schlenker's pragmatic emulation. For, how should this work? Should we first derive the weak predictions by means of pragmatic principles and subsequently invoke pragmatics again to strengthen the predictions that have just been obtained by their very means? This would immediately raise a question as to the rationale of first deriving the weak predictions. But Schlenker has an alternative:

> [...] we apply Transparency to a simple clause *without* taking into account the syntactic environment in which [it] occurs. [...] instead of computing the *minimum* accommodation to guarantee that q is (incrementally) transparent, you decide, somewhat lazily, to just consider $q\overline{q'}$ on his own, and to compute Transparency with respect to this constituent alone. (p. 30)

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[5]   But see footnote 8.

[6]   The formulation may suggest that I subscribe to such a strategy. Nothing could be further from the truth. Limitations of space prevent me to go into this issue here, however.

That is, we ignore the linguistic context and apply the theory to the triggering configuration as if it occurred in isolation. This correctly predicts that all of (4a) through (4d) presuppose that France has a king.[7] But it would also predict that (2c) and each of (3a) though (3d) presuppose that there is a king of France. This holds generally. On this strategy complex sentences always inherit the presuppositions of their parts. Staightforward application would bring us back to Langendoen & Savin's (1971) cumulative hypothesis which since the observations by Karttunen and others in the early 70s has not been defended by anyone.

This leaves Transparancy Theory with two escape routes, each equally powerful.[8] Firstly, if triviality or contradiction threatens, the theory does not apply and no presupposition is predicted. If on the other hand intuition asks for a more substantial presupposition, laziness takes over; we simply ignore the surrounding context and thus predict that the triggered material makes it unmodified to the main context. Depending on the phenomena we thus may choose between total cancellation or total preservation. For a theory that presents itself primarily as superseding others in 'explanatory adequacy' this is somewhat disappointing.

3.   Explanory adequacy

Schlenker critizes Heim's account for lack of 'explanatory adequacy'. Now Heim showed that given her definitions of the context change potential of the logical connectives Karttunen (1974) type inheritance conditions fall out as a side effect of the contextual update. This is right. Sure, Heim slightly overstated her point. As Soames pointed out, we may give alternative dynamic definitions for the connectives which agree with the incremental version on their static truth conditions but show different

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[7]   Schlenker's discussion suggests that 'accommodating' the stronger presupposition is licensed because it is 'distinguished as a 'pre-condition' of the meaning' and therefore salient. I don't see how this is supposed to work. Is the proposition that there is a king of France more salient in (4a) then in (2c)? The reverse seems to be the case.

[8]   One could imagine an optimality-theoretic elaboration which would tell us what principle applies when. Though this would make the theory predictive it would also raise the question what is the point of deriving the Karttunen/Heim predictions in the first place.

inheritance conditions. An example is $\wedge^*$ which has the following definedness conditions:

(7) $C[\varphi \wedge^* \psi]$ is defined if $C[\psi]$ is defined and $C[\psi][\varphi]$ is defined.

When evaluating this 'conjunction' we process from right to left, first checking whether the presuppositions of the second conjunct are satisfied and then whether the presupposition of the first conjunct updated with the second one are satisfied. However, the fact that it is possible to define such a connective can hardly count as an argument against a dynamic definition of the logical connectives. For, though $\wedge^*$ is formally a possible connective, it certainly is not a reasonable one. The simple fact that time doesn't flow backwards, utterances are processed in time and human cognition developed in a universe where this so happens, definitely discouraged this faculty to process information this way. This excludes $\wedge^*$, though not for logical reasons.[9]

Since I don't want to get involved in a general philosophical discussion on the notion of explanatory adequacy of theories, I just state two reasonable prerequisites for a theory of presupposition. We would like to see an explication of the notion of presupposition which explains why presuppositions have a function in discourse that distinguishes them from mere entailments in a classical logic; and, secondly, an explication of the projection behaviour of the presuppositions. And the latter should be regulated by general principles of a logical or pragmatic nature. Unfortunately Schlenker's account is not very enlightening on either of these issues. On Schlenker's picture a presupposition is a part of bivalent meaning, 'one that strives to be articulated as a separate conjunct' (p. 3–4). This begs the question. For what semantic or pragmatic feature urges a part of bivalent meaning to struggle for articulation? Worse, this characterisation is – as we will see in a moment – circular in view of the fact that 'Be articulate' depends on the notion of presupposition. As to the second question,

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[9]   The discussion reminds me of the infamous connective *tonk*. Is a system of natural deduction arbitrary, given that it is possible to define a connective that has the introduction rule of a disjunction and the elimination rule of the conjunction? Of course not. It only shows that we need reasonable constraints on the definition of connectives. And these are not internal to the system but given at a metalevel and motivated in terms of the role they play in the full theory.

the basic intuition is the Stalnakerian one: presuppositional information is – in a sense to be explained – information that is taken for granted and ideally already part of the incoming context at the moment the sentence is uttered. The problem then is to explain why the information induced (the presuppositional part in Schlenker's terminology) has – in contradistinction to the non-presupposition remainder – the properties that account for this special behaviour.

Schlenker gives an answer to this question as well. His theory is 'explanatorily adequate' in the sense that the prediction of projection is fully regulated by pragmatic principles of a Gricean nature. But how Gricean are they? As stated 'Be articulate' does not constrain the projection of presuppositions but directly depends on the notion of presupposition (the information triggered). This is worrying since for Schlenker the presuppositional parts of a sentence meaning are simply bivalent meaning components that struggle for articulation. Moreover, the principle invites the speaker to explicitly state ('articulate') the presuppositional component, something which – in Schlenker's bivalent account – seems quite superfluous in view of the fact that this information is already entailed by the inducing sentence. For why should a speaker articulate (1a) as (2a) when 'Be articulate' is controlled by 'Be brief' and the speaker could convey the same information by the shorter but truthconditionally equivalent non-articulated version (note that 'Be articulate' is defeasible and 'Be brief' is never violated).

I have problems with Schlenker's version of 'Be brief' as well. It is clearly not a matter of length (which would exclude (2a) and render only its pronominal variant (8) felicitous).

(8)   France has a king and he is bald.

And then, the difference in length is often not spectacular or simply non-existent. In the following pair the articulated and non-articulated variant are of equal length.

(9)   a.   John knows that he is ill.
      b.   John is ill and knows it.

What Schlenker calls 'briefness' turns out to be a limited version of what is (non)informativity or semantic redundancy on other accounts. It thus should not be derived from Grice's Manner as Schlenker suggests but from Quantity 1 and 2.

4.   An historical excursus

Let me draw attention to a simple (but admittedly old fashioned) bivalent alternative that was developed in the early 80s.[10] This account agrees with the intuition of Stalnaker and other theorists that presuppositional expressions contain information that is ideally part of the incoming context. In the absence of further information a cooperative speaker will thus try to interpret such a sentence over contexts that already contain the information invoked. In the default case this will give us the presupposition as a contextual entailment; the presupposition will thus pass unharmed (we would nowadays call it 'accommodation'). Thus

(10)   Either baldness is not hereditary or John's children are bald.

is predicted to presuppose that John has children. The reason is that (10) can be felicitously interpreted in a context which contains this information as the acceptability of (11) shows:

(11)   John has children. And either baldness is not hereditary or his children are bald:

This theory does not try to articulate the induced information as separate conjunct to check whether this conjunct is superfluous and the non-articulated version preferable. Instead it tries to 'articulate' this information straightforwardly in the main context, thus mimicking the behaviour of a cooperative hearer. If the interpreter succeeds, the sentence is predicted to be presupposing. But clearly, not any sentence is interpretable in any context. It may be that a sentence is not felicitous in a context which already contains the presuppositional information. This happens if the interpretation of the inducing sentence in a context which already contains the presuppositional information violates Gricean requirements of informativity (let us call this – incremental – efficiency). For example, (12)

(12)   Either John does not have any children or all his children are in hiding.

is not acceptable in a context which contains the information that John has children, as (13) shows:

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[10]   Van der Sandt (1982/1988), not to be confused with his later anaphoric account.

(13)   John has children. . . . Either he has no children or his children are all in hiding.

The reason is that in the given context (12) is equivalent to its second disjunct:

(14)   John's children are in hiding.

which is certainly a shorter, less redundant and a more efficient way to convey the information that John's children are in hiding (note that this is a more general version of Schlenker's 'Be brief'). The original sentence thus cannot be interpreted in any context which contains the presuppositional material of the second disjunct and this information will consequently be interpreted locally. Put otherwise, the full sentence is not presupposing for the simple reason that the information cannot be accommodated. This is captured in the following simple definition:

(15)   A sentence φ presupposes a sentence ψ in a context c just in case
   (i)   one of the component sentences of φ induces the presuppositional information that ψ; and
   (ii) φ is acceptable in $c + \psi$.[11]

It turns out that constraints of global and local informativity and consistency suffice as constraints on acceptability.[12]

   The account just sketched has several vices which it shares with Schlenker's and all other pragmatic accounts. As in Gazdar (1979) it remains unclear what happens to presuppositions in case they don't survive (and why then should this information be invoked to begin with), it is unable to formally capture the notion of accommodation,[13] and it runs into binding problems in intensional contexts.

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[11]   The original definition contained an extra (and awkward) clause intended to account for sentences with conflicting presuppositions. This clause turns to be superfluous since contradictory presuppositions are already handled by clause (ii). This was pointed out long ago by Henk Zeevat (p.c.).

[12]   See for details Van der Sandt (1982/88) and Beaver (2001).

[13]   The problem is that accommodation is an operation on input contexts. Global accommodation expands an input context c into a richer context c' which contains the material that is required to process the relevant sentence. On a static account we have no choice but to compute the presupposition and then increment it in the subsequent context. This plays havoc with the defining characteristic of presuppositions. For formally they so end up on a par with assertoric material.

The account is also superior to Schlenker's in various ways. It gives a simple and intuitive notion of presupposition, projection behaviour is regulated by independent Gricean principles (it is thus presumably 'explanatorily adequate' in Schlenker's sense), it captures all of Gazdar's predictions and improves on his account by an incremental account of conjunctions. And – last but not least – it does not run into the proviso problem.

5.　Postlude

Transparency Theory achieves its primary goal. It derives the Karttunen/Heim predictions without having to specify the heritage properties for the logical connectives. But it does so at the cost of the simplicity and elegance we perceive in its original incarnation. Schlenker gives his account in a static two-valued semantics. However if we want to develop a presupposition theory in a purely pragmatic way it is unwise to first derive the Karttunen/Heim predictions and then to invoke two powerful mechanisms that make the core of the theory superfluous. In its present state Transparancy Theory is better not called a theory. For to count as a theory it should at least have predictive power. We might take it to be an intellectual exercise to establish some equivalence results. But that's not the way it is advertised. It is advertised as an exercise in anti-dynamics. I consider the prospects of such an enterprise moot. So here is my final advice: dynamize. And as DRT-versions have shown, this does not necessarily involve a dynamic definition of the conjunction.

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Presupposition projection: Explanatory strategies*

PHILIPPE SCHLENKER[1]

1. Introduction

The Transparency theory (Schlenker 2007, this volume) was designed to meet the following challenge:

(1) *Explanatory Challenge*: Find an algorithm that predicts how any operator transmits presuppositions once its syntax and its classical semantics have been specified.

The main properties of the analysis are summarized in (2).

(2) a. *No Local Contexts*: presupposition projection is analyzed without recourse to a notion of 'local context'.
   b. *No Trivalence*: presupposition projection is analyzed within a bivalent logic.
   c. *Incremental/Symmetric*: the projection algorithm accounts for linear asymmetries by quantifying over good finals[2] of a sentence (incremental version); the algorithm can optionally be relaxed to predict weaker presuppositions (symmetric version).

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[2] If α is a string, a string β is a 'good final' for α just in case αβ is a well-formed sentence.

   d.   *Pragmatic Inspiration*: the algorithm is motivated by pragmatic
        considerations – specifically, by two Gricean maxims of manner.

   Since the paper was written, several new theories have emerged which
meet the explanatory challenge in other ways. I believe that 'Be Articu-
late' should be seen in the context of this broader collective enterprise,
which aims to achieve greater explanatory depth in the study of presup-
position projection. As can be seen in (3), the new theories differ from
each other along the four dimensions listed in (2), and yet they all solve
the explanatory problem that motivated the Transparency theory.

(3)   Explanatory Theories[3]

	Templates on dynamic entries *LaCasse 2008*	Symmetric dynamic semantics *Rothschild 2008, this vol.*	Recon- struction of local contexts *Schlenker 2008a*	Trivalent Theories *George 2007, 2008, Fox, this vol.*	Presuppo- sitions *qua* impli- catures *Chemla 2008b*	Trans- parency Theory *Schlenker 2007, this vol.*
Local Contexts?	Yes	Yes	Yes	No	No	No
Trivalence?	Yes	Yes	No	Yes	No	No
Incre- mental / Symmetric?	No	Yes	Yes	Yes/No	Yes	Yes
Pragmatic?	No	No	Yes	Yes/No	Yes	Yes

2.   Problem and proposal

2.1.   *The explanatory problem*

But is there an explanatory problem to begin with? Rooth 1987 and
Soames 1989 were in no doubt that there is: dynamic semantics makes it
possible to define far too many connectives and operators, including ones
that are never attested in natural language. Heim, the pioneer of the

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[3]   *Yes/No* indicates that different versions of a given theory provide different answers.

approach, endorsed the criticism[4]. But later researchers didn't always agree that there was indeed a serious problem.

In this volume, van der Sandt discusses the 'deviant' connective *and** (defined by: C[F and* G] = C[G][F]) and writes that it is not a 'reasonable' connective for the simple reason that 'time doesn't flow backwards, utterances are processed in time and human cognition developed in a universe where this so happens'. The suggestion seems to be that some cognitive constraints take care of ruling out the unattested operators that the dynamic approach generates. This is an interesting line of investigation, but van der Sandt doesn't offer the beginning of a general account of what these constraints are. Appealing to 'processing in time' is not by itself sufficient; as was noted by Rooth, Soames, and most other researchers, the problem is completely general and affects 'deviant' connectives which do not 'do things in the wrong order', so to speak. As Rothschild aptly points out, ''an update procedure for conjunction doesn't have to be ''backwards'' not to make the right predictions: consider C[A] ∩ C[B]'' as an update rule for C[A and B]. In fact, in the case of disjunction, the dynamic camp has been sharply divided, with some (e.g. Beaver 2001) positing an asymmetric disjunction (C[A or B] = C[A] ∪ C[not A][B]), while others posited a symmetric one (C[A or B] = C[A] ∪ C[B], as in Geurts 1999). No general principles could be appealed to in order to settle the debate, which is a symptom of precisely the problem that motivated the Transparency theory. As Fox writes, the expressive power of the dynamic framework ''leads to an unpleasantly easy state of affairs for the practitioner: when one encounters new lexical items, one appears to be free to define the appropriate update procedure, i.e. the one that would derive the observable facts about presupposition projection''. In this sense, the goal of the Transparency theory was precisely to make the practicioner's task *harder*[5].

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[4] ''In my 1983 paper, I [. . .] claimed that if one spelled out the precise connection between truth-conditional meaning and rules of context change, one would be able to use evidence about truth conditions to determine the rules of context change, and in this way motivate those rules independently of the projection data that they are supposed to account for. I was rightly taken to task for this by Soames (1989) and Mats Rooth (pers. comm., 3/27/1987)'' (Heim 1990).

[5] Importantly, the 'explanatory challenge' as stated in (1) does not require that one's algorithm be itself reducible to independently motivated principles – though this would un-

Beaver suggests that the resulting theory is too constrained, and that for this reason we should stick to dynamic semantics; but he grants that some version of the Transparency theory might be seen as "providing an explanation for why certain dynamic meanings for connectives and operators should arise historically. In this case, we would have a pragmatically motivated theory that allowed for peculiarities to creep in to the satisfaction properties, or dynamic meanings, of individual operators." Crucially, Beaver doesn't wish to apply the analysis to all connectives because he thinks that in some cases it makes incorrect predictions, or that it is difficult or impossible to apply to new cases. His proposal might seem to compound the problem: we used to have one problem of overgeneration, and now we have two. For we must decide for each connective whether (some version of) the Transparency theory should apply to constrain its entry. And for the connectives that don't fall under the theory, we have in addition all the problems that already arose in Heim's framework. This is not to say that this line of investigation couldn't be developed; but as it stands, it doesn't solve the explanatory problem.

2.2.   *Applying the Transparency theory*

Of course to say that the Transparency theory solves the explanatory problem is not to say that it is right. But it has the advantage of being refutable on the basis of data that involve other operators than those that motivated it. To effect the refutation, however, precision is needed. As one applies the theory to a sentence S, one must have (1) a clear specification of the syntax of S, (2) a list of presupposition triggers that occur in S, and (3) a clear notion of equivalence among the modifications of S that enter in the algorithm (typically (3) is achieved by making *precise* as-

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doubtedly be desirable. The challenge is to find an algorithm which is *general*, and thus which does not require as many axioms as there are connectives and operators. In his commentary, Krahmer rightly observes that there is much less independent evidence for *Be Articulate* than for *Be Brief*, and asks whether this does not affect the 'explanatory depth' of the theory; it does, but not in the sense of the 'explanatory challenge' in (1) (similarly, all the 'explanatory theories' listed in (3) must at some point postulate some new principles to account for presupposition projection – but this does not mean they are not explanatory in the sense of (1)).

sumptions about the bivalent truth conditions of the relevant constructions). Beaver (this volume) seeks to apply the theory to sentences involving *because* and *before*, and obtains undesirable results. But his derivation of the predictions is entirely informal, and it fails to satisfy conditions (2) and (3). First, (A) his analysis does not take into account the fact that *because* and *before* are typically presupposition triggers – *p because F* and *p before F* generally presuppose *F*, and it is thus unsurprising that for $F = qq'$, *q* should be presupposed as well[6]. Second, (B) even when one disregards this fact, a rigorous application of the theory (i.e. one that is based on the statement of precise truth conditions) is likely to yield much stronger predictions than are obtained by Beaver[7]. Finally, (C) in the case

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[6]   The examples in (i) suggest that *p because F* and *p after F* tend to presuppose *F* when *F* contains no presupposition triggers (though to my ear the inference is weaker in (ib) than in the other cases).

   (i)   a.   Will Obama win because he is the smarter candidate?
              ⇒ Obama is the smarter candidate.
         b.   Is Mary happy because there was a storm?
              ⇒? There was a storm
         c.   Did Smith embezzle money before he murdered Jones?
              ⇒ Smith murdered Jones.
         d.   Did Mary go to the doctor before John said she should rest?
              ⇒ John said Mary should rest.

[7]   Suppose we disregard point (A), and apply the Transparency theory to *(p because qq')*. Beaver claims that our prediction is that *if p, then one of the reasons is that q*; for instance, he attributes to our theory the prediction that *Mary is happy because the storm is far away* only presupposes that [BC] *if Mary is happy, then one of the reasons is that there is a storm*. But this is not what our theory predicts. The principle of Transparency requires that for any appropriate *d*, C ⊨ (p because (q and d)) ⇔ (p because d). And Beaver's condition applied to his own example does not guarantee this. Suppose that Mary lives in a place in which storms can only occur in winter, that there is a storm (= *q*), and that she is happy (= *p*) because of this. Beaver's condition [BC] is thus satisfied. Taking *d* = *it's winter*, which is entailed by *q, Mary is happy because (q and d)* has the same value as *Mary is happy because q*; and the latter is true, since by assumption *Mary is happy because there is a storm* [a complicating matter is that one wouldn't *say Mary is happy because q and d* when *q* entails *d*, but this does not affect the present point]. Still, the sentence *Mary is happy because d* might well be false: replacing *d* with its value, we get *Mary is happy because it is winter*, which certainly does not follow from [BC] together with the assumption that *Mary is happy because there is a storm*.

   To see what the Transparency theory *does* predict, we need to settle on a semantics for *because*-clauses – by no means a simple matter; the Transparency theory is indeed difficult to apply, but this is because finding clear equivalence conditions for sentences with *because*-clauses is itself a difficult matter. For purposes of illustration, we adopt a simpli-

fied Lewisian theory of causation: *p because d* is analyzed as (i) *p and d and ((not d) →* *(not p))*, where → is a Stalnakerian conditional (Stalnaker 1975), although one which we take to have a contextually given domain restriction. Informally, $F → G$ evaluated at w is true just in case the closest world from w which satisfies F and lies in the domain restriction D(w) also satisfies G (D(w) must include C, among others). Given Stalnaker's semantics, (i) can be simplified to *p and ((not d) → (not p))*, and thus the incremental principle of Transparency can be stated as in (ii)a, which can be simplified to (iib) and (iib′) (**p** is the set of worlds satisfying *p*):

(ii)   a.   For any d, C $\models$ (p and ((not d) → (not p))) ⇔ (p and ((not (q and d)) → (not p)))

b.   For any d, C ∩ **p** $\models$ ((not d) → (not p)) ⇔ ((not (q and d)) → (not p))

b′.   For any d, C ∩ **p** $\models$ ((not d) → (not p)) ⇔ (((not q) or (not d)) → (not p))

We make the simplifying assumption in (iii), which is plausible if the domain of worlds quantified over is 'large enough':

(iii)   *Simplifying Assumption*: For every w in C ∩ **p**, for every world w′ in D(w), there is a more remote world w″ in D(w) such that *p* has a different value in w′ and in w″

(*Example*: if Mary is happy in w′, there is a more remote world that also lies in the domain restriction D(w), but in which she is not happy. Note that by the very nature of the Lewisian analysis, the truth of *p because qq′* normally requires that we access some *(not p)*-worlds so as to make the counterfactual *(not qq′) → (not p)* true. So if *p because qq′* is to be non-trivial, some *(not p)*-worlds must plausibly lie in D(w). This does not mean that *p* – or for that matter *qq′* – cannot be presupposed, because D(w) could be much larger than the context set C; in other words, it could be that *p* holds throughout C, but that D(w) is large enough to contain some *(not p)*-worlds.)

With these assumptions, we can show that (iib) is equivalent to (iv):

(iv)   *Predicted Presupposition*: for every world w in C ∩ **p**, q holds true throughout D(w).

Before we prove this claim, we note that (iv) entails (and is in fact quite a bit stronger than) C $\models$ p ⇒ q – which is precisely, according to Beaver, 'what a Karttunen-type system would presumably generate', and what he claims our analysis is too weak to obtain.

It is clear that (iv) entails (iib): for any w, → evaluated at w only 'sees' worlds in D(w), hence the result. Now suppose that (iv) does not hold. Then for some world w in C ∩ **p**, there is a world of D(w) in which *(not q)* is true, and we call w′ the closest such world (from w). By the Simplifying Assumption in (iii), there is a more remote world w″ in D(w) such that *p* has a different value in w′ and in w″, and we let *(not d)* be true of w″ and nothing else. We evaluate (iib′) at w, and we note that the closest world that satisfies *(not d)* is w″, and the closest world that satisfies *((not q) or (not d))* is w′ (the latter condition follows because w″ is more remote than w′, hence the closest world that satisfies the disjunction is just the closest world that satisfies *(not q)*, i.e. w′). Thus the biconditional in (iib′) evaluated at w ends up making the claim that *(not p)* has the same value at w″ as it does at w′. But since by assumption *p* has different values at w′ and w″, (iib′) is false. So we have shown that if (iv) does not hold, (iib′) – and hence (iib) – does not hold. In other words, (iib) entails (iv). (Thanks to Daniel Rothschild for discussions of presupposition projection in *because*-clauses).

of *before*, a failure to apply condition (1) leads to an equivocation in the Logical Forms that are used in computing Transparency[8].

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8   Beaver's example (18a) (= *Mary went to the doctor before John realized she had been sick*) is ambiguous, depending on how the tense of his most embedded clause is resolved; but his example (18b) (= *Mary went to the doctor before she had been sick and John realized it*) rules out one of the readings. As a result, his discussion hinges on an equivocation between the Logical Forms involved. The presence of an ambiguity in one case but not in the other can be seen by considering non-presuppositional examples:

(i)   a.   Mary went to the doctor before John made the claim that she had been sick.
      b.   Mary went to the doctor before she had been sick.

The time of Mary's sickness in (ia) can be understood to be specified deictically, and it is only constrained to be before [what John takes to be] the time at which John made his claim; in particular, the sentence is most plausibly read with the time of Mary's sickness *preceding* the time of her going to the doctor. No such reading is available in (ib), because in this case the time variable of *had been sick* must be bound by *before* (and hence the time of Mary's sickness must *follow* the time of her going to the doctor). Beaver equivocates between these distinct Logical Forms. To see how the Transparency theory in fact works (albeit in simplified form), we apply it to (ia), on a reading in which the most deeply embedded tense is deictically specified to denote t^* (this requires an extension of the analysis to a fragment with time variables). We analyze *Mary went to the doctor before John realized she had been sick* as in (ii), where $S(t^*)$ stands for *Mary is sick at t^**, $T(t')$ (which will turn out to be immaterial) stands for *John thinks at t' that Mary had been sick at t^**, and $D(t)$ stands for *Mary went to the doctor at t*. As a first approximation, we get the Logical Form in (iib) (where t_0 denotes the time of utterance), paraphrased in (iib'):

(ii)   a.   Mary went to the doctor before John realized that she been sick.
       b. $[\exists t: t < t_0 \text{ and } D(t)]\ [\forall t': \overline{S(t^*)}T(t')]\ (t' > t)$
       b'. 'Some past time at which $\overline{\text{Mary}}$ went to the doctor precedes any time at which John realized that Mary was sick at the (contextually given) moment t^*'

The principle of Transparency applied to (iib) yields (iii) (though a longer discussion of variables would be needed):

(iii)   For any appropriate d', C $\models [\exists t: t < t_0 \text{ and } D(t)]\ [\forall t': S(t^*) \text{ and } d'(t,t')]\ (t' > t) \Leftrightarrow [\exists t: t < t_0 \text{ and } D(t)]\ [\forall t': d'(t,t')]\ (t' > t)$

It is clear that the condition is satisfied if (iv) C $\models [\exists t: t < t_0]\ D(t) \Rightarrow S(t^*)$. Now suppose that that (iv) is falsified, and thus that for some w in C, w $\models [\exists t: t < t_0]\ D(t)$ and (not $S(t^*)$). Taking d' to be the formula $t' = t$, we see that the right-hand side of (iii) is false (since it boils down to $[\exists t: t < t_0 \text{ and } D(t)]\ (t > t)$), but the left-hand side is true because (a) $[\exists t: t < t_0]\ D(t)$ is true, and (b) no moment satisfies the restrictor of the universal quantifier, which makes the claim vacuously true. This shows that (iv) is the presupposition we predict for (ib); it is a conditional presupposition of the form *if Mary went to the doctor, she had been sick at t^** – which is entirely different from the 'prediction' derived by Beaver.

When Conditions (1)–(3) are met, applying the Transparency theory is often straightforward. In 'Be Articulate', I showed that the analysis derives a desirable result concerning *unless*: since *unless F, G* has essentially the same syntax and bivalent truth conditions as *if not F, G*, we expect that the two constructions should project presuppositions in the same way – a prediction which appears to be correct, but is not made by dynamic semantics.

In more involved cases, the principle of Transparency may be harder to apply because the criterion of equivalence between the relevant expressions is not obvious. This problem arises with respect to questions: under what conditions are two questions equivalent? In this case, one has no choice but to commit to a theory of questions before on can derive precise predictions from the Transparency theory. Let me give an example of how this could be done.

Does John know that he is incompetent? presupposes that *John is incompetent*; and *Who among these ten students knows that he is incompetent?* plausibly yields an inference that *each of these ten students is incompetent*. Why? For technical simplicity, I adopt the analysis of questions of Krifka 2001, which treats questions as functions from their term answers (e.g. *yes / no*, or *Mary / Sam / John*) to full propositions (e.g. *it is raining / it is not raining*, or *Mary came / Sam came / John came*). As a result, two questions are identical just in case they yield the same result at *each* of these arguments. When we combine this criterion with the Transparency theory, it derives the desired results. Let us see how.

– For *yes/no*-questions, we apply Transparency to *? pp'*, which yields a requirement that for every appropriate *d*, *?(p and d)* be contextually equivalent to *?d* – which in turn holds just in case $C \models (p \text{ and } d) \Leftrightarrow d$, and $C \models \text{not } (p \text{ and } d) \Leftrightarrow \text{not } d$. The second condition is redundant, and we obtain the same presupposition as for *pp'*: the question presupposes *p*.

– For *wh*-questions, we obtain for the question *who PP'* a requirement that for every appropriate D, *who (P and D)* be contextually equivalent to *who D*. If the individuals in the domain are named by terms $c_1, c_2, \ldots$, this yields a requirement that for every i, $C \models (P \text{ and } D)(c_i) \Leftrightarrow D(c_i)$, which in turn holds just in case every individual is presupposed to satisfy *P*. In other words, we predict universal projection in *wh*-questions – which is a plausible result.

It should be added that there are other cases in which the Transparency theory is difficult to apply because of intrinsic weaknesses of the analysis. In this respect, Beaver offers an excellent criticism of the analysis when it comes to comparatives – where for syntactic reasons the 'articulated' competitor we postulated is syntactically ill-formed. We come back to this point in Section 6.

3.   Defending the dynamic approach

One might initially have the impression that dynamic semantics has no way of addressing the explanatory challenge. But this is not so: as is demonstrated by Rothschild (2008, this volume), explanatory analyses can be developed within a dynamic framework. In fact, there are several ways to do so, which makes the debate all the more interesting.

Rothschild's solution is to embrace the overgeneration, so to speak – since any classical operator can be dynamicized in countless different ways, why not say that *all* of them are acceptable? As Rothschild writes, "instead of Heim's single update procedure for each binary formula $A * B$, we now have an infinite set of acceptable update procedures which are equivalent, in the bivalent case, to conjoining the common ground with $A * B$." Connectives are thus multiply ambiguous, but in a principled way; this is the logic that was adopted in another domain in Partee and Rooth's analysis of conjunction, which posited a type-shifting rule that could produce conjunctions of infinitely many different logical types (Partee and Rooth 1983). Rothschild shows that in simple cases his analysis derives something close to the predictions of the symmetric version of the Transparency theory (but with one improvement, to which we return below). So in particular, C[A and B] is defined just in case C[A][B] is defined *or* C[B][A] is defined. It is still possible to 'incrementalize' the analysis by adopting a system close to that of the Transparency theory; as Rothschild writes, "to do this we simply say that any complex CCP S is incrementally acceptable in C iff for any starting string of S, α, and any string β such that a) the only atomic CCPs in β are such that they are always defined and b) $\alpha\beta$, the concatenation of α and β, is a well-formed CCP, C[$\alpha\beta$] is defined''. Rothschild believes that the symmet-

ric version of the theory is empirically useful, but of course if one only wants the incremental version, one can make the incremental component obligatory.

We come back below to some issues of implementation. But the main question raised by this approach lies in its motivation (a point that Rothschild would grant, I believe). Rothschild observes from the start that the analysis does not follow from considerations of belief update: "while it is somewhat plausible to think that people update beliefs sequentially when they encounter an unembedded conjunction, there is no obvious algorithm of belief update mid-sentence for compound constructions generally". Furthermore, one of the original selling points of the dynamic approach was that it could capture the linear asymmetries observed in presupposition projection. But these can only be derived from Rothschild's reconstruction with the help of a device, quantification over good finals, which can be used in a non-dynamic approach as well to yield closely-related results. Rothschild does permit dynamic semantics to meet the explanatory challenge, but this comes at a price: he starts by obliterating the asymmetries, and then regains them with a syntactic mechanism akin to that of the Transparency theory.

Interestingly, a more conservative defense of dynamic semantics was recently offered by LaCasse (2008), who shows that under certain conditions one can 'filter out' undesirable dynamic entries by (i) importing certain constraints on operators that have been studied in generalized quantifier theory, and (ii) imposing 'templates' on possible operators. The result is very interesting, and it nicely complements Rothschild's own work: LaCasse's system is completely asymmetric, and is in this sense the mirror image of Rothschild's fundamentally symmetric analysis.

Another defense strategy would be to import into the dynamic approach some ideas related to the Transparency theory. As van der Sandt and Beaver note, the latter is itself based on a notion of 'local triviality' which is present in dynamic analyses; the difference is that in the Transparency theory it is supposed to do all the work, whereas for dynamic analyses it is just one device among many. In Beaver's earlier work, triviality was stated in a symmetric fashion (Beaver 1997, 2001), but in his commentary he gives an incremental version reproduced in (4)a; and he suggests that incremental triviality makes it possible to reconstruct the Transparency theory more simply, as in (4)b.

(4) a. *Triviality*: A is (incrementally) trivial in a sentence S in context
         C if for any S′ formed from S by replacement of material on the
         right of A with arbitrary grammatically acceptable material that
         does not refer back anaphorically to A, replacing A by a tautol-
         ogy has no effect on whether C satisfies S′[9].

     b. *Local Satisfaction*: Suppose B is a subpart of sentence S. A is lo-
         cally satisfied at the point where B occurs if A would be (incre-
         mentally) trivial if the sentence obtained by replacing B by A
         in S.

Beaver claims that the result is equivalent to the Transparency theory.
Let us apply this analysis to an example; we consider the formula *(No
P . QQ′)*, which is predicted by the Transparency theory to presuppose
that every P-individual is a Q-individual, and we assume for simplicity
that C is reduced to a single world. Applying (4)b, Beaver's reformulation
requires that Q be locally satisfied at the point where $QQ′$ occurs. This
means that Q would be incrementally trivial in *(No P . Q)*. Now we apply
(4)a, and obtain the condition that whenever we replace material to the
right of Q with arbitrary grammatically acceptable material (without
pronouns), replacing Q with a tautology T has no effect on whether C
satisfies the sentence. Since the only grammatical material to the right of
Q is the right parenthesis), we end up with the condition in (5):

(5) Beaver's reformulation applied to *(No P . QQ′)*
     $C \models (No\ P . Q) \Leftrightarrow (No\ P . T)$

It is immediate that in any world w the right-hand side is never satisfied
when **P**(w) is non-empty. Assuming that this is the case throughout the
context set, Beaver's reformulation predicts that $C \models (No\ P . Q) \Leftrightarrow F$,

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[9] As Beaver points out, this mirrors within a non-DRT syntax his earlier definition of
     'local informativity', which was designed to formalize a similar notion within DRT
     (Beaver 1997):

     (i) No sub-DRS is redundant. Formally, if K is the complete DRS structure and K′
          is an arbitrarily deeply embedded sub-DRS, K′ is redundant if and only if ∀M, f,
          (M, f $\models$ K → M, f $\models$ K[K′ / T]). Here K[K′/T] is a DRS like K except for having
          the instance of K′ replaced by an instance of an empty DRS, and $\models$ denotes the
          DRT notion of *embedding*.

     The crucial difference is that (i) is 'symmetric', whereas (4)a is 'incremental'.

where F is a contradiction; or in other words, that C $\models$ (Some P . Q). This is of course a much weaker inference than is predicted by the Transparency theory, which derives instead that C $\models$ (Every P . Q); Beaver's 'reformulation' is in fact a different theory. And it is not empirically adequate: as Chemla 2008a shows with experimental means, subjects robustly obtain universal inferences in this case. In another part of his work, Chemla (2006) shows that *in the propositional case* the Transparency theory can be reformulated using tautologies only; Beaver's reformulation might seem to work when one disregards all quantifiers[10]. But when one doesn't, things are not so simple: our particular statement of the principle of Transparency, which requires that C $\models$ (No P . (Q and d)) $\Leftrightarrow$ (No P . d) *no matter what d* is, turns out to be crucial in this case (proving the equivalence with Heim's dynamic semantics in a reasonably general case is not quite trivial; in Schlenker 2007, the proof was based on a detailed analysis of the 'tree of numbers' for generalized quantifiers). One can then ask why a conjunction would seem to be crucial to achieve the desired result; it was the goal of 'Be Articulate' to explain this.

Still, parts of the Transparency theory can be imported into a broadly dynamic framework – which makes the debate with dynamic semantics a bit more complicated than was said in 'Be Articulate'. In Schlenker 2008a, I tried to reconstruct a notion of local contexts *without* recourse to context change potentials. The idea was that the local context of an expression E is the strongest c' such that for any d that appears in the position of E, one can compute *(c' and d)* rather than d without affecting the truth conditions of the sentence. In so doing, one can in a way 'restrict attention' to the domain c', which might simplify the computation of the relevant meanings. Be that as it may, the definition came in a symmetric and in an incremental version; and the latter was shown to be nearly equivalent to the Transparency theory[11] – which in turn guarantees near-

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[10]   Similarly, when one disregards quantifiers one can make sense of Beaver's almost exclusive reference to Karttunen's work. One of the important contributions of Heim 1983 was precisely to show how quantifiers can be integrated into a dynamic framework.

[11]   Here is a version of the incremental definition:

(i)   The local context of a propositional or predicative expression d that occurs in a syntactic environment $a \_ b$ in a context C is the strongest proposition or property x which guarantees that for any expression d' of the same type as d, for all strings b'

equivalence with Heim's theory. So in the end we *can* reconstruct a notion of local context, one which makes it possible to keep some key insights of Stalnaker's (and Karttunen's) work. Importantly, however, we can do so without adopting a dynamic 'semantics' in the strict sense, and without positing context change potentials[12]. So we have at least three ways to reconstruct some version of the dynamic approach without falling victim to the explanatory problem faced by Heim's analysis; the debate is now open.

4. Trivalence revisited

4.1. *Trivalent triggers*

In 'Be Articulate', I analyzed a simplified language in which the distinction between 'presuppositions' (which are subject to 'Be Articulate') and 'assertions' (which are not) is syntactically encoded, although both components are otherwise treated as part of a bivalent meaning (specifically, $\underline{d}d'$ is interpreted as the conjunction of d and d'). In his very interesting remarks, Sauerland raises three important questions. (i) First, isn't there a strange indeterminacy in the bivalent account? For if $\underline{d}d'$ is a presuppositional expression, exactly the same result would be obtained if we replaced d' with d'', as long as *(d and d')* is equivalent to *(d and d'')*. (ii) Second, shouldn't one *expect* that predicates should in general be trivalent, if they carry selectional restrictions? (iii) Finally, can we implement within the bivalent framework the view that definite descriptions are referential (i.e. that they are of type e – a view accepted by quite a few semanticists)?

(i) The worry about the indeterminacy of the assertive component need not arise in the theory as originally stated, because the latter never makes

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that guarantee that $a\ d'b'$ is a well-formed sentence, $C \models^{c' \to x}$ a (c' and d') b' $\Leftrightarrow$ a d' b' (If no strongest proposition or property x with the desired characteristics exists, the local context of d does not exist).

[12] One can also combine several analyses. For instance, one can use the reconstruction of local contexts in Schlenker 2008a to impose LaCassian templates on dynamic connectives. The result is a dynamic semantics, but one from which the problem of overgeneration has been eliminated (see Schlenker 2008a for discussion).

reference to the assertive component on its own: it does make reference to the presupposition $\underline{e}$ of an expression E, and to the total bivalent meaning of E, which we may write as $\underline{e}e'$; but it never makes reference to e' alone. In other words, the theory in its original form has no need for a notion of 'assertive component' – with the result that the indeterminacy of the latter is not a problem (importantly, such is not the case of the revised version of symmetric Transparency which we discuss in Section 5.3; there Sauerland's worry is quite real).

(ii) Although the Transparency theory was developed in a bivalent framework, it is fully compatible with a trivalent analysis of presupposition triggers, as long as the indeterminate value # is treated by all connectives and operators in exactly the same way as the value 0 (= falsity). In this fashion, we can have our cake and eat it too: logical operators have essentially a bivalent semantics, but we use trivalence to encode which parts of a meaning are subject to 'Be Articulate'. Specifically, given a propositional expression E, we can recover its presupposition $\pi(E)$ and its total meaning $\mu(E)$ as in (6) (the case of predicative expressions is similar).

(6) a. $\pi(E) = \lambda w \,.\, 1$ iff $E(w) \neq \#$; 0 otherwise
     b. $\mu(E) = \lambda w \,.\, 1$ iff $E(w) = 1$; 0 otherwise

Thus if e denotes $\pi(E)$ and e' denotes $\mu(E)$, we can treat E as if it were the expression $\underline{e}e'$, to which *Be Articulate* as stated can be applied (note that as defined e' entails e, but by remark (i) this does not matter).

(iii) What about definite descriptions? We can have them denote # when their presupposition is not met. We then add that for any world w and any predicate P, $P(d)$ denotes # at w if d denotes # at w. Using (6), we then recover the presupposition of $P(d)$ and apply *Be Articulate* to it.

This is of course a very minimal way of introducing some trivalence into the analysis, since the connectives and operators remain fundamentally bivalent. But one could explore an entirely different route, in which the latter are given a non-trivial trivalent semantics.

4.2. *Trivalent operators*

In 1975, Peters wrote a response to Karttunen's work in which he argued that a dynamic analysis was not needed to account for presupposition

projection. His key observation was that a directional version of the Strong Kleene logic could derive Karttunen's results (the trivalent approach was further developed in Beaver and Krahmer 2001). Strictly speaking, Peters's paper did not meet the 'explanatory challenge' we laid out at the outset, because he did not derive the truth tables of his connectives from their bivalent behavior together with their syntax (a point that also applies to Beaver and Krahmer 2001). But in 2006, Ben George and Danny Fox independently suggested that the challenge could be met by making explicit the 'recipe' implicit in the Strong Kleene logic, and by making it directional (in fact, they did so before learning of Peters's approach).

The basic idea is to treat a semantic failure as an uncertainty about the value of an expression: if qq' is evaluated at w while q is false at w, we just don't know whether the clause is true or false (and the same holds if the presuppositional predicate $\underline{Q}Q'$ is evaluated with respect to a world w and an individual d which make Q false). The semantic module outputs the value # in case this uncertainty cannot be resolved – which systematically happens with unembedded atomic propositions whose presupposition is not met. But in complex formulas it may happen that *no matter* how the value of $\underline{q}q'$ (or $\underline{Q}Q'$) is resolved at the point of evaluation, one can still unambiguously determine the value of the entire sentence. This is for instance the case if *(p and $\underline{q}q'$)* is evaluated in a world w in which p and q are both false: qq' receives the 'indeterminate' value #, but no matter how the indeterminacy is resolved, the entire sentence will still be false due to the falsity of the first conjunct p. Thus for any world w in the context set, the sentence will have a determinate truth value just in case either (i) p is false at w (so that it doesn't matter how one resolves the indeterminacy of the second conjunct); or (ii) q is true (so that the second conjunct has a determinate truth value). Since we are solely interested in worlds that are compatible with what the speech act participants take for granted, we derive the familiar prediction that the context set must entail that *if p, q.*

In this case, the Strong Kleene Logic suffices to derive the desired results. But in its original form, this logic would also make the same predictions for *if (not $\underline{q}q'$), (not p)*; in other words, it yields a 'symmetric' account of presupposition projection. Peters, George and Fox propose to make the system asymmetric. There are several ways to do so. Peters

stipulated appropriate truth tables. George defines an algorithm that takes as input the syntax and bivalent semantics of various operators, and yields a compositional trivalent logic which is sensitive to the linear order of its arguments[13]. By contrast, Fox proposes to make Strong Kleene incremental by adopting the (non-compositional) device of quantification over good finals.

The new trivalent theories, which already come in three versions (George has two, Fox has one), are in my opinion some of the most interesting analyses of presupposition currently on the market. They have a considerable advantage over other theories (with the notable and very interesting exception of Chemla 2008b): they predict different patterns of projection for different quantifiers, something that seems desirable in view of the experimental results discussed in Chemla's contribution. In brief: *every student* and *no student* reliably give rise to universal inferences, but other quantifiers – *less than three students, more than three students, exactly three students* do not (here subjects are roughly at chance on universal inferences). The trivalent theory of George 2007 predicts non-universal inferences for *less than three students* and *more than three students*, but it incorrectly predicts universal inferences for *exactly three students*; George 2008 develops a system in which this prediction is no longer made. In the general case, it can be shown that a version of the incremental trivalent analysis favored by Fox yields the same predictions as the Transparency theory in the propositional case, and weaker ones in the quantificational case (Schlenker 2008b).

The case of the quantifier *no* is particularly interesting, because robust universal inferences were obtained in Chemla's experiment. This might pose a difficulty for the trivalent approach. If we treat indeterminacy as uncertainty, it takes very little to make *(No P. $\underline{Q}Q'$)* false – it is enough to find one P-individual that satisfies both Q and Q' (as soon as this condition is met, any uncertainty about the value of $\underline{Q}Q'$ with respect to

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[13]   One could try instead to make the operators sensitive to the order given by constituency relations, but this would arguably yield incorrect results. *[q [and pp']]* is often assumed in syntax to have a binary- and right-branching structure, which would mean that the *second* conjunct would have to be evaluated 'before' the first one – an undesirable result.

other P-individuals fails to have any consequence: the claim is refuted). To give an example, *No student stopped smoking* is predicted to be false in case some student who smoked is now a non-smoker, so trivalent approaches don't predict a universal presupposition in this case. What is true, on the other hand, is that the conditions for *truth* (as opposed to the conditions for *definedness*) entail that every student used to smoke. To see this, note that if any student s didn't smoke before, the value of QQ' at s will be #, which will prevent us from being certain that the sentence is true. So *if* the sentence is true, we can infer that every student smoked.

Thus the debate hinges on a rather subtle difference: is the universal inference we obtain with *no* a presupposition (i.e. a condition that must be met for the sentence to have a determinate truth value), or is it an entailment (i.e. a condition that must be met for the sentence to be true)? Chemla's experimental results do not decide the issue. One way to address it would be to develop more fine-grained experimental methods that distinguish between 'falsity' and 'presupposition failure'. Alternatively, we can embed the test sentences under operators that destroy normal entailments, though not presuppositions. In this connection, it is interesting to note that in *yes/no*-questions universal inferences are quite clearly preserved, as was noted above: *Does none of these ten students know that he is incompetent?* carries an implication that *each of these ten students is incompetent*. We showed above that the Transparency theory can derive this result when it is combined with Krifka's theory of questions. Like the Transparency theory, the Trivalent approach is based on a condition that requires equivalence between certain (semantic) modifications of the original sentence. As a result, under Krifka's analysis, it will also predict that the presupposition of $?(No\ P\ .\ QQ')$ should be the conjunction of the presupposition of $(No\ P\ .\ QQ')$ (the 'yes' answer) and of *not (No P . QQ')* (the 'no' answer). In simple trivalent accounts, *not F* has a determinate value just in case *F* does, so we end up with the same weak presupposition that $(No\ P\ .\ QQ')$ has – but now we cannot use its assertive component to account for the universal inference we observe.

This only scratches the surface of a debate that promises to be quite interesting. As things stand, it would appear that the trivalent approach is at an advantage with respect to (some) numerical quantifiers, but that it might yield predictions that are too weak for *no*.

5.   Incremental vs. symmetric

5.1.   *Quantification over good finals*

As is explained by Fox, the device of quantification over good finals (or 'sentence completions') can be applied to a variety of analyses to turn a 'symmetric' account into an incremental one. In fact, there are now at least five theories that make use of precisely this mechanism: Fox's trivalent analysis, Chemla's analysis of presuppositions as implicatures, Rothschild's dynamic analysis, the reconstruction of local contexts in Schlenker 2008a, and the Transparency theory. As was mentioned by Fox and independently by Ed Stabler, one would do well to apply the algorithm to derivation trees rather than to strings: the simple language I used in 'Be Articulate' made the two options equivalent, but at the cost of introducing quite a few brackets to encode the derivational history of a sentence in the object language.

5.2.   *Are symmetric readings real?*

By their very nature, then, these theories are modular: they contain a 'symmetric core', which is then made 'incremental by a different algorithm. But this immediately raises a question: is there independent evidence for the symmetric core?

   The centerpiece of 'Be Articulate' was an incremental account. But I suggested that although presuppositions are preferably satisfied incrementally, they are marginally acceptable when they are symmetrically satisfied. Reactions to this suggestion could not have been more diverse: Rothschild endorses symmetry, and makes it the core of his account – as does Chemla in his own analysis of presuppositions (Chemla 2008b); Beaver expresses complete skepticism. Both Krahmer and Chemla emphasize the importance of experimental evidence – and rightly so; as Krahmer writes, it is now 'essential to combine theory building with careful experimentation'.

   Let us consider a specific example. I argued in 'Be Articulate' that *if not qq', not p* can (marginally) be understood with the presupposition *if p, q* – i.e. with the *incremental* presupposition of *if p, qq'*. In ongoing

work conducted by Chemla and myself, we attempt to test this prediction with experimental means. The question is subtle, because we only claim that presuppositions can *marginally* be satisfied by the symmetric algorithm; in other words, sentences whose presuppositions are symmetrically but not incrementally satisfied should have an intermediate status. In order to obtain acceptability judgments (as opposed to inferences), we explored the behavior of the presupposition trigger *too* in French ('aussi'), which has the advantage of making accommodation – and in particular local accommodation – very difficult or impossible (why this is so is another matter, which goes beyond the present discussion; see Beaver and Zeevat 2007 for helpful remarks in this respect). This means that when the presupposition of *aussi* is not satisfied, the resulting sentence is deviant. We asked subjects to rate the acceptability of sentences such as those in (7)[14] by way of magnitude estimation (for each sentence, they had to click on a bar whose extremes corresponded to 'weird' (0% acceptable) or 'natural' (100% acceptable)).

(7)   L'évolution du salaire des fonctionnaires va être remise à plat.
      The evolution of state employees' salaries will be reconsidered.
      a1. Si les infirmières sont augmentées, les salaires des enseignants seront eux aussi {A. revalorisés / B. bloqués}.
      If the nurses get a raise, the teachers' salaries will THEM too be {A. increased / B. frozen}.
      a2. Si les infirmières sont augmentées, les salaires des enseignants seront {A. revalorisés / B. bloqués}.
      If the nurses get a raise, the teachers' salaries will be {A. increased / B. frozen}.
      b1. Si les salaires des enseignants ne sont pas eux aussi {A. revalorisés / B. bloqués}, les infirmières ne seront pas augmentées.
      If the teachers' salaries are not THEM too {A. increased / B. frozen}, the nurses won't get a raise.
      b2. Si les salaires des enseignants ne sont pas {A. revalorisés / B. bloqués}, les infirmières ne seront pas augmentées.

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[14]   *Aussi* associates with focus, which can cause undesired ambiguities. To circumvent the problem, we inserted *aussi* right after a strong pronoun (e.g. *eux aussi*, literally 'them too'), which yielded unambiguous sentences.

If the teachers' salaries are not {A. increased / B. frozen}, the nurses won't get a raise.

(7)a1A displays the canonical order *if p, qq′*, where *p* entails *q*: the pre-supposition of the consequent is satisfied by the antecedent. (7)a1B should be deviant because the presupposition of the consequent is not entailed by the antecedent – in fact, it is contradictory with it. (7)a2 offers non-presuppositional controls. Finally, (7)b1–b2 are like (7)a1–a2, except that *if F, G* is replaced with *if not G, not F* – which makes it possible to test the predictions of the symmetric analysis. We expected (7)a1A to be acceptable, (7)a1B and (7)a2B to be unacceptable, and – crucially – (7)b1A to have an intermediate status. The results are represented in (8)[15].

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[15]   There were 13 subjects and 3 parameters: 1. ±Pres: is a presupposition trigger present? (*yes* in a1–b1 sentences, *no* in a2–b2 sentences); 2. ±Coherent: is the version of the sentence with the trigger coherent? (*yes* in A sentences, *no* in B sentences); 3. ±Canonical: does the version of the sentence with the trigger have its canonical order? (*yes* in a sentences, *no* in b sentences). Each line in the graph plots the acceptability judgments obtained for the parameters ±Pres and ±Coherent; the continuous line corresponds to +Canonical, and the dotted line corresponds to −Canonical. We asked three questions: (i) With respect to the canonical order (= continuous line), does the presence of a contradictory trigger make the sentence worse? The difference between the results for a sentence and its non-presuppositional control reflects the specific contribution of the trigger to the acceptability of the sentence. Therefore, question (i) was addressed by comparing the slope between the first two points of the line (a1A–a2A) to the slope between the last two points (b1A–b2A): adding a contradictory trigger should make the sentence far worse than adding a coherent trigger. Technically, we ran a 2×2 ANOVA with factors ±Pres and ±Coherent restricted to the items in canonical order (third factor set to +Canonical). This yields a significant interaction ($F(1, 12) = 48$, $p < .05$): the presence of a contradictory trigger lowers the acceptability of the sentence. (ii) Same question as (i), but with respect to the reversed order (i.e. the dotted line). Here too the result was positive: we ran the same ANOVA as above, except that it was restricted to the items in non-canonical order (−Canonical), and it yielded a significant interaction ($F(1, 12) = 6.9$, $p < .05$). (iii) Finally, we wanted to know whether the presence of a coherent trigger was more acceptable in the canonical than in the reversed order (independently from possible influences of any trigger, even a contradictory one, in any given position). We addressed this question by determining whether the preference for the coherent trigger [relative to the incoherent one] in (i) and (ii) was greater in the canonical than in the reversed order. The result was positive: the full $2 \times 2 \times 2$ ANOVA yielded a significant interaction ($F(1, 12) = 25$, $p < .05$). (Thanks to E. Chemla for help with this footnote).

(8) Acceptability judgments for the canonical and reversed orders in conditionals
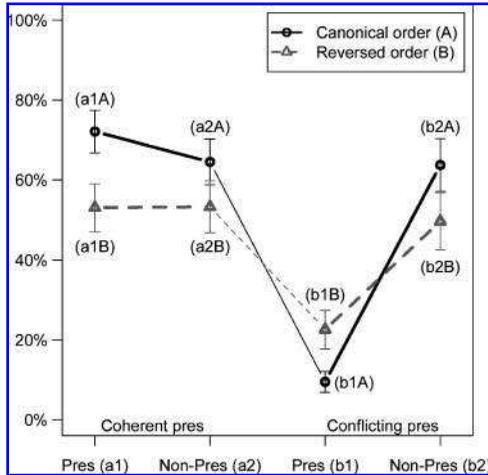
For conditionals, the results confirm the existence of a symmetric reading with an intermediate acceptability status; in a nutshell, the presence of a coherent trigger in the reversed order (= (7)a1B) yields an acceptability rating which is lower than the analogous case in the canonical order (= (7)a1A), but still much higher than the incoherent cases ((7)b1A and B). The experiment is still ongoing for a variety of other constructions, and additional triggers should be tested as well. Although the question should still be considered open, it can now be approached with experimental means.

5.3. *Questions of implementation*

Rothschild and Beaver correctly note that the symmetric version of the theory requires a refinement. The problem comes up when several triggers appear simultaneously in the sentence: on the symmetric version of the

analysis, the presupposition of a given conjunct or disjunct can serve to justify the presupposition of the other, which does not seem right[16].

There is a simple fix, however. We define for every string s a string $s*$ obtained by deleting all underlined material. We then define a slightly modified notion of transparency, which we call Transparency*: $\underline{dd}'$ satisfies Transparency* with respect to the string $a\ \underline{dd}'\ b$ just in case $a*\ \underline{dd}'\ b*$ satisfies the 'old' version of Transparency. In effect, we now require that only the assertive component of the other expressions be used to satisfy the presupposition of any given trigger (note that in this modified version the analysis *does* make reference to the assertive component of an expression, which makes Sauerland's worry about the indeterminacy of the latter entirely relevant).

Interestingly, this analysis makes slightly different predictions from Rothschild's symmetric theory. Schematically, the disagreement concerns sentences like (9), which is identical to (7)b1 except for the fact that *either* has been added in the consequent. This is a case in which the antecedent uses the (negation of) the assertive component of the consequent to justify its presupposition, while the consequent uses the assertive component of the antecedent to justify its own presupposition.

(9)   If the teachers' salaries are not increased too, the nurses won't get a raise either.

The modified version of symmetric Transparency predicts this example to be marginally acceptable, while Rothschild's analysis predicts it to be un-

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[16]   A similar problem had been discussed in more abstract form in Schlenker 2008a (fn. 9 and Appendix; ms. submitted on Feb. 8, 2008), both with respect to the Transparency theory and with respect to our reconstruction of local contexts. In particular, it was mentioned that "in the example in (i), it is predicted that no presupposition failure obtains, despite the fact that both $\underline{pp}'$ and $\underline{qq}'$ trigger a failure on their own."

(i)   a. $(\underline{pp}'$ and $\underline{qq}')$
       b. $C = \{w_1, w_2\}, w_1 \not\models p, w_1 \not\models q, w_2 \models p$ and $w_2 \models \underline{q}$

Beaver's example, which is more striking, is a version of (ia) with $q = p$. (Beaver asserts that I predict "that these examples have no presupposition at all", but this isn't quite right, since sentences that only satisfy symmetric Transparency were crucially claimed to have an *intermediate* acceptability status. Still, the problem which was brought up is quite real, of course.)

acceptable. Heeding Krahmer's and Chemla's advice, this is certainly a disagreement that should be settled on experimental grounds.[17]

6. The nature of *Be Articulate*

We could take the principle of Transparency to be a primitive of the theory. But in the article I tried to derive it from two more basic constraints: *Be Brief* and *Be Articulate*, two Gricean[18] maxims of manner (*Be Brief* requires that one *not* pronounce a vacuous conjunct, while *Be Articulate* enjoins the speaker to articulate a complex meaning as a con-

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[17] Beaver raises another worry, which concerns the relation between the incremental and the symmetric principles. In 'Be Articulate', I suggested as a possibility that

"the acceptability of a sentence $\alpha\ \underline{d}d'\ \beta$ is inversely correlated with the acceptability of its 'articulated' competitor $\alpha\ (d\ and\ \underline{d}d')\ \beta$: the more acceptable the latter, the less acceptable the former. As a result, when $\alpha\ (d\ and\ \underline{d}d')\ \beta$ is weakly ruled out by the symmetric version of *Be Brief*, $\alpha\ \underline{d}d'\ \beta$ is only weakly acceptable; by contrast, when $\alpha\ (d\ and\ \underline{d}d')\ \beta$ is strongly ruled out by the incremental version of *Be Brief*, $\alpha\ \underline{d}d'\ \beta$ is fully acceptable."

Beaver implements this informal suggestion in a modified version of Optimality Theory, and derives undesirable predictions. But for our purposes, it is enough to state the condition as follows: [C] the deviance incurred by a sentence $\alpha\ \underline{d}d'\ \beta$ which violates *Be Articulate* with respect to $\underline{d}d'$ is inversely correlated to the deviance of its articulated competitor $\alpha\ (d\ and\ \underline{d}d')\ \beta$. In Beaver's example (12b) [*John used to smoke and he has stopped smoking*], the sentence does not violate *Be Articulate* to begin with, hence it is entirely acceptable. (It should also be noted that Beaver's particular implementation is in general ill-defined because the acceptability of $\alpha\ \underline{d}d'\ \beta$ is determined by that of $\alpha\ (d\ and\ \underline{d}d')\ \beta$, and vice versa; there is no guarantee that a unique solution satisfies this circular dependency. I believe the problem does not arise in [C] above: since *(d and $\underline{d}d'$)* never violates *Be Articulate*, the status of $\alpha\ \underline{d}d'\ \beta$ is determined by sentences that have a strictly smaller number of unarticulated triggers, which should make circular dependencies impossible.)

[18] Some commentators (e.g. Beaver) have expressed skepticism about the 'Gricean' nature of *Be Articulate*. But as Rothschild points out, the 'pragmatic prohibition' against 'using one short construction to express two independent meanings' is 'quite an old one', and it goes back to ... Grice himself (as well as Stalnaker). In particular, quite a few years after his initial work on implicatures, Grice proposed to add a new maxim of manner to account for presuppositions; its statement was very close to *Be Articulate*: 'if your assertions are complex and conjunctive, and you are asserting a number of things at the same time, then it would be natural, on the assumption that any one of them might be challengeable, to set them out separately and so make it easy for anyone who wanted to challenge them to do so' (Grice 1981). See also Stalnaker 1974 for a related idea.

junction). While *Be Brief* is not too controversial, the commentators (especially Beaver, Krahmer, Sauerland and van der Sandt) have raised five questions about *Be Articulate*: (i) In what sense is it pragmatic? (ii) Is there independent evidence for it? (iii) Why is it less highly ranked than *Be Brief*? (iv) Can is be computed 'locally' as well as 'globally'? (this question also applies to *Be Brief*); (v) What happens when, for extrinsic reasons, a presupposition cannot be articulated? These are entirely legitimate questions, and the strongest form of the theory cannot be defended without an answer to them.

(i) In a weak sense, *Be Articulate* is pragmatic because it deals with meaning at a post-compositional level (since the principle takes as an input the syntax and bivalent semantics of a sentence). In a strong sense, one would like to show that the principle follows from a theory of rationality[19]. This is a desire, not a result. The best we can do at the moment is argue that there is independent evidence for it.

(ii) In other work (Schlenker 2006), I tentatively argued that some cases of adjectival modification lead to deviance because they violate *Be Articulate*:

(10) a. ?John is an autistic chemist.
      b. John is autistic, and he is a chemist.
      c. John is an autistic child[20].

This is of course another domain where experimental evidence would be needed. In these cases, one presumably obtains deviance rather than a presupposition because when it is presupposed that, say, John is a chem-

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[19] It should be mentioned that the theory of presuppositions-*qua*-implicatures defended in Chemla 2008b might offer a different way of reducing a theory of presupposition to pragmatic principles.

[20] Note that the semantic nature of the noun crucially matters, which suggests that the phenomenon does indeed have to do with excessive richness of the meaning expressed. Here are two further examples from Schlenker 2006:

  (i) a. ?John is a suicidal oncologist.
       b. John is an oncologist and he is suicidal.
       c. John is a suicidal student.

  (ii) a. ?John is a parricidal linguist.
        b. John is a linguist. He is a parricide.
        c. John is a parricidal adolescent.

ist, one would save on words by saying *John is autistic* rather than *John is an autistic chemist*. The case of adverbial modification is minimally different because adverbs cannot be predicated of a DP in the absence of a verb; and there I argued that weakened presuppositional effects are indeed obtained, for instance in *None of these ten students came late* (inference: each of these ten students came). These conclusions were confirmed with experimental means in Chemla 2008a, c.

(iii) The question of the relative ordering of *Be Brief* and *Be Articulate* is currently open.

(iv) As Sauerland observes, both *Be Articulate* and *Be Brief* are applied globally, i.e. with respect to entire sentences (in the incremental version, the end of the sentence is considered to be unknown, but the principles nonetheless apply globally – which is the reason we need to quantify over good finals). One could explore a version of the theory in which the same principles can also apply locally – but obviously such a system would have to be constrained. I leave this question open.

(v) The last question is possibly the most difficult one. Chris Potts and Louise McNally both asked about presuppositions that are so complex that they can hardly be articulated in any reasonable way (e.g. presuppositions triggered by discourse particles). Beaver mentions interesting cases in which the syntax makes it difficult to articulate a presupposition as an initial conjunct[21]. Although the derived principle of Transparency can deal with these cases, the pragmatic primitives cannot because there is no articulated competitor to begin with. The theory must be weakened to deal with these examples. One way to do so is to take the pragmatic principles to be encapsulated, in the sense that they don't have access to all the syntactic or morphological facts that rule out some articulated conjuncts (note that a similar move was already made in the theory when we took the algorithm to work as if any meaning whatsoever could be expressed). I believe there are similar cases of encapsulation in the domain of scalar implicatures: for me, *There were delegates from New York at the meeting* yields an inference that *not all* delegates from New York

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[21]   His example concerned the deviance of *? Mary is thinner than there is a King of France and he is fat*, which should be the 'articulated' form of *Mary is thinner than the King of France is fat*.

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were at the meeting, despite the fact that the corresponding alternative is ungrammatical (*all* – or for that matter *most* – is not an intersective quantifier, and thus one cannot say *There were all delegates from New York at the meeting*). Another way to weaken the theory is to take *Be Articulate* to be pragmatic in the weak sense (= it applies to meanings at the post-compositional level), but not in the strong sense (= it does not derive from a theory of rationality). Either way, the theory must be somewhat modified and rethought.

7. The Proviso Problem

All the proposals we have discussed so far – and in particularly all the explanatory theories listed in (3) – predict conditional presuppositions for sentences of the form *p and qq′* or *if p, qq′*. But as was argued in detail in van der Sandt 1992 and Geurts 1996, 1999, these predictions are often too weak, a difficulty that Geurts called the 'Proviso Problem'. The DRT approach to presuppositions is designed to address it. By contrast, dynamic semantics and all the proposals listed in (3) – including the Transparency theory – must rely on additional pragmatic mechanisms to strengthen conditional presuppositions when this is empirically necessary. Since the problem cuts across theories, it was explicitly left out of 'Be Articulate'. But it is only fair that van der Sandt should reiterate his general objections in the context of the present theory[22]. There is admittedly a

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[22] A side-issue is that van der Sandt's modal examples, which all involve definite descriptions, turn out to be neutral among the competing theories when one adopts a language with the full power of explicit quantification over possible worlds, as is now standard (Cresswell 1990, Heim 1991). For instance, van der Sandt's example (4) [*If baldness is hereditary, the king of France is bald*] turns out to have a Logical Form in which the world argument of the noun is indexed to the actual world, as in: [*if$^{w^*}$ λw baldness is hereditary-w*] [*λw the $^{w^*}$[king of France] is bald-w*], where w^* denotes the actual world. With a quantificational analysis of conditionals, Heim's theory (1983) would presumably predict a presupposition that *for every accessible possible world w, there is exactly one king of France in the actual world w^**. Since the quantification is vacuous, we get an *unconditional* presupposition that there is a king of France. This is a side-issue, however, because (i) this line of argument does not extend to non-intensional examples, and (ii) in any event, other intensional examples can be constructed to make van der Sandt's point without recourse to definite descriptions.

growing body of work on this topic, which could easily be adapted to the present analysis (see for instance Beaver 2001, Heim 2006, Perez Caballo 2007, Singh 2007, and van Rooij 2007); but the problem is still largely open.

The DRT approach championed by van der Sandt is initially in a stronger position to address it. But it raises problems of its own (see also Beaver 2001 for discussion).

(i) First, it does not meet the explanatory challenge that inspired the new theories listed in (3): it crucially depends on 'accessibility relations' that determine possible accommodation sites; and these relations must be stipulated for each connective and operator on a case-by-case basis (for instance, in Geurts 1999 the antecedent of a conditional is accessible to the consequent; but the first element of a disjunction is not accessible to the second – and this difference is stipulated).

(ii) Second, DRT makes incorrect predictions in quantified examples. Due to the fact that a presupposition trigger that contains a bound variable cannot be resolved in a position in which the variable would become unbound, in *[No x: P(x)] QQ'(x)* DRT predicts at most two readings: *[No x: P(x) and Q(x)] Q'(x)* and *[No x: P(x)] (Q(x) and Q'(x))*. Neither reading derives the universal inference that *[Every x: P(x)] Q(x)* – an inference for which Chemla 2008a found strong experimental evidence. Things initially look better for *[Every x: P(x)] QQ'(x)*, where local accommodation could yield *[Every x: P(x)] (Q(x) and Q'(x))*[23], hence the inference that *[Every x: P(x)] Q(x)*. But when we consider questions (*Does each of these ten students know that he is incompetent?*), it becomes non-trivial to determine why the universal clause can somehow leap out of the scope of the question operator.

(iii) Third, there are cases in which conditional presuppositions are quite clearly needed:

(11) If you accept this job, will you let your parents know that you work for a {priest | thug}?
⇒ If you accept this job, you will work for a {priest | thug}

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[23] Obtaining this representation isn't quite trivial, because DRT posits a general preference for accommodation at the highest possible site – which would typically yield *[Every x: P(x) and Q(x)] Q'(x)*.

Global accommodation yields inferences that are too strong; and here too, local accommodation fails to explain how the conditional clause can somehow leap out of the scope of the question operator.

I believe that DRT could be re-formulated so as to address the explanatory problem (as well as some of the other difficulties); but I also suspect that key ideas of the theories listed in (3) will have to be borrowed in order to do so.

As this discussion makes clear, quite a few issues are still open for the Transparency theory. But I hope that the present debate suggests that there are now many interesting ways to address the explanatory challenge that motivated it.

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