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 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 a donkey beats it.
b. John owns a donkey. He beat it.

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

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This paper was already accepted for publication when several other alternatives to the dynamic account of presuppositions came to light, for instance George 2007, 2008 and Chemla 2007b (for its part, the theory developed in Schlenker 2008a, b offers a kind of synthesis between the present account and theories of local satisfaction). It is purely for chronological reasons that these new developments are not discussed here.

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[1]. Thus its fortune rests in large part on the analysis of presupposition projection[2]. 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[3]. 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 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

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[1]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 intertranslatable. See Dekker 1997 and Elbourne 2005; see also Chierchia 1995 for a general discussion of dynamic semantics.

[2] 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.

[3] 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.

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[4]

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 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)

Borrowing the formalism of Heim 1983, 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 *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 $\neq \#$, $C[\underline{p}p'] = \{w \in C, p'(w) = 1\}$

[4] This section follows in part Schlenker 2006a, b.

(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] ≠ # and C[F][G] = #). If ≠ #, 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...* . 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[5].

(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

[5] 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.

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 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 *and*, 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[6]. Specifically, Heim's approach can handle a full fragment such as the one in (6), in which both predicates and propositions may be presuppositional[7]:

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

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 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 (< >) around them and around the corresponding part of the update rules.

(7) **Dynamic Semantics**
$C[p] = \{w \in C: p^w = 1\}$
$C[\underline{p}p'] = \#$ iff for some $w \in C$, $p^w = 0$; if $\neq \#$, $C[\underline{p}p'] = \{w \in C: p'^w = 1\}$
$C[(\text{not } F)] = \#$ iff $C[F] = \#$; if $\neq \#$, $C[(\text{not } F)] = C - C[F]$
$C[(F \text{ and } G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \# \text{ and } C[F][G] = \#)$; if $\neq \#$, $C[(F \text{ and } G)] = C[F][G]$
$C[(F \text{ or } G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \# \text{ and } C[\text{not } F][G] = \#)$; if $\neq \#$, $C[(F \text{ or } G)] = C[F] \cup C[\text{not } F][G]$
$C[(\text{if } F.\ G)] = \#$ iff $C[F] = \#$ or $(C[F] \neq \# \text{ and } C[F][G] = \#)$; if $\neq \#$, $C[(\text{if } F.G)] = C-C[F][\text{not } G]$
$C[(Q_i <\underline{P}>P'.<\underline{R}>R')] = \#$ iff <for some $w \in C$, for some $d \in D$, $\underline{P}^w(d) = 0$> or <for some $w \in C$, for some $d \in D$, $<\underline{P}^w(d) = 1$ and> $P'^w(d) = 1$ and $\underline{R}^w(d) = 0$>. If $\neq \#$,

[6] 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.

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

$C[(Q_i<\underline{P}>P'.<\underline{R}>R']) = \{w \in C: f_i(a^w, b^w) = 1\}$ with $a^w = \{d \in D: P'^w(d) = 1$ and $R'^w(d) = 0\}$, $b^w = \{d \in D: P'^w(d) = 1$ 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 set. 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[8], 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, *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-

[8] Heim, who has made this point repeatedly in writing and in lectures, credits Mats Rooth for this observation.

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 1993, 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 1979, which is currently undergoing a revival (see George 2007, 2008).

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 < > 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 $p^w = p'^w = 1$
$w \models$ (not F) iff $w \not\models F$
$w \models$ (F and G) iff $w \models F$ and $w \models G$
$w \models$ (F or G) iff $w \models F$ or $w \models G$
$w \models$ (if F. G) iff $w \not\models F$ or $w \models G$
$w \models (Q_i<\underline{P}>P'.<\underline{Q}>Q')$ iff $f_i(a_w, b_w)=1$ with $a_w=\{d \in D: <P^w(d) = 1$ and$> P'^w(d) = 1$ and $(<Q^w(d) = 0$ or$> Q'^w(d) = 0)\}$, $b_w=\{d \in D: <P^w(d) = 1$ and$> P'^w(d) = 1$ and $<Q^w(d) = 1$ and$> Q'^w(d) = 1\}$

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 $\underline{r}$ 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[9]. Eventually we would want to *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[10].

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 *dd'* should be preferably expressed as *(d and dd')* (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 *dd'* as *(d and dd')*
(... 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 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

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

[10] 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.

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. ?She is pregnant and she is very happy.
ii. She is very happy.

b. Context: Nothing is assumed about Mary.
i. #Mary is expecting a son and she is pregnant and 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, she is pregnant and 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 (33)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 γ β (we will sometimes say that the two sentences are 'contextually equivalent' in C). The same analysis applies to (33)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[11]. This situation is illustrated in (16)-(17):

(16) a. Mary is pregnant and she is expecting a son.
a'. #Mary is expecting a son and she is pregnant.
b. If Mary has a big belly, she is pregnant and she is expecting a son.
b. #If Mary has a big belly, she is expecting a son and she is pregnant.

(17) a. John resides in France and he lives in Paris.
a'. #John lives in Paris and he resides in France.
b. If John is in Europe, he resides in France and he lives in Paris.
b'. #If John is in Europe, he lives in Paris and he resides in France.

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 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

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

turns out to be (this is similar to the constraint of 'local informativity' of other theories, e.g. van der Sandt 1993). 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 *s s'* (for instance, *smokes* is a good final for *John often* because *John often smokes* is a grammatical sentences 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 |= α (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[12]).

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 … *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 d')*… is ruled out because *d* is incrementally transparent. This derived principle is henceforth called *Incremental Transparency*:

(19) **Incremental Transparency**
Given a context cet C, a predicative or propositional occurrence of *d'* is acceptable in a sentence that begins with α *d'*
if the 'articulated' competitor α *(d and d')* is ruled out because *d* is transparent,
if for any expression γ of the same type as *d* and for any good final β,
C |= α (d and γ) $\beta \Leftrightarrow \alpha\ \gamma\ \beta$

(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. ?She is pregnant and 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 she is pregnant and 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, she is pregnant and 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.

[12] See Schlenker 2008b for a discussion (initially started by D. Fox and E. Stabler).

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 |= (p and γ) β ⇔ γ β
b. *Claim:* Transparency is satisfied ⇔ C |= p
c. *Proof*
⇒ : Suppose that *Transparency* is satisfied. In particular, taking β to be the empty string and γ to be some tautology, we get:
C |= (p and γ) ⇔ γ, and hence
C |= p, as desired.
⇐ : Suppose that C |= p. Since γ is a clause, it is a constituent and so is *(p and γ)*. Since the semantics defined in (12) is extensional[13], *(p and γ)* and γ can be substituted *salva veritate* in C, and thus for each good final β, (p and γ) β ⇔ γ β.

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 |= 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 |= ((p and γ) and δ) ⇔ (γ and δ). When γ and δ are both tautologies, we obtain: C |= p.

More interesting is the case in which the presupposition trigger is 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 |= (p and (q and γ) β ⇔ (p and γ β
b. *Claim:* Transparency is satisfied ⇔ C |= (if p . q)
c. *Proof*
⇒ : Suppose that Transparency is satisfied. In particular, taking β to be the right parenthesis *)* and γ to be some tautology, we have:
C |= (p and (q and γ)) ⇔ (p and γ), hence [because γ is a tautology]
C |= (p and q) ⇔ p
and in particular
C |= p ⇒ q. But since we treat conditionals as material implications, this is just to say

[13] 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).

that C |= (if p. q).
⇐ : Suppose that C |= p ⇒ q. Then for each clause γ, C |= (p and (q and γ)) ⇔ (p and γ), and it also follows that for any good final *β'*:
C |= (p and (q and γ)) β' ⇔ (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'*[14]. But since *γ* and *(q and γ)* are constituents, *(p and (q and γ) β* and *(p and γ β* 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 |= p, Transparency is satisfied because for any appropriate *γ*, *(p and γ)* is contextually equivalent to *γ*. Conversely, if Transparency is satisfied, C |= (if (p and γ) . δ) ⇔ (if γ. δ). Taking *δ* to be a contradiction and *γ* to be a tautology, we get C |= (not p) ⇔ δ, hence the result that C |= 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):

(23) **(if p . qq')**

a. *Transparency* requires that for each clause *γ* and each good final *β*,
C |= (if p . (q and γ) β ⇔ (if p . γ β

b. *Claim:* Transparency is satisfied ⇔ C |= p ⇒ q

c. *Proof*
⇒ : Suppose that Transparency is satisfied. In particular, taking *β* to be the right parenthesis *)* and *γ* to be some tautology, we have
C |= (if p . (q and γ)) ⇔ (if p . γ), hence
C |= (if p . q)
⇐ : Suppose that C |= (if p . q). Then for each clause *γ*, C |= (if p . (q and γ)) ⇔ (if p. γ), and for any acceptable *β'*, C |= (if p . (q and γ)) β' ⇔ (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 *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 2006a. Here we simply state the main conclusions.

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

(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 (complemented with the treatment of disjunction in Beaver 2001). We write Transp(C, F) if the formula F satisfies Transparency (as stated in (19)), and we write w |= 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 ⊆ W:
(i) Transp(C, F) iff C[F] ≠ #.
(ii) If C[F] ≠ #, C[F] = {w∈C: w |= 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 αA 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 $\alpha A \beta$ 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, $C |\neq \alpha A \beta \Leftrightarrow \alpha T \beta$ and $C |\neq \alpha A \beta \Leftrightarrow \alpha F \beta$.

'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 $\alpha A \beta$ 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[15]? When 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):

[15] There exists a 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.

(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 bald, 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[16].

It should be added that a third kind of accommodation, 'intermediate accommodation', has been vigorously defended in van der Sandt 1993 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.

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

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[17]. In particular, the intuitive equivalence between *Unless John came, F* and *Unless John came, John came and F* ensures that the correct projection results are obtained for the sentence *Unless John came, Mary will know that he is here*: if C |= (if John came. John is here), we also have that for every good final *β,* C |= (Unless John came, (John is here and F) β ⇔ Unless John came, 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*[18]. 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 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.

---

[17] 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.

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

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-neutrally, the result simply follows from the observation that *John would like Mary to be incompetent, and he would like Mary to be incompetent and 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 entirely 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 he would like her to be (incompetent) and ...
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 q̲q')* presupposes that *(if p . q),* but *(q̲q'and p)* presupposes that *q*; similarly, *(p or q̲q')* presupposes that *(if (not p), q)*, but *(q̲q' 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[19]; 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-posted *if*-clauses, which behave very much like pre-posed ones[20]). 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[21], it is tempting to appeal to 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 or that Mary is pregnant (as the case may be), one of the

[19] This is only a 'near' equivalence because of the notorious problem of the 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 *some* cases *if G, H* is indeed contextually equivalent to *if not H, not G*. And this is undoubtedly the case.

[20] 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.

[21] 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.

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[22].

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*[23]: 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-*

[22] I believe that the data partly hinge on intonation, but I leave this issue for future research.
[23] Within a non-monotonic analysis, *if F, G* and *if not G, not F* are not logically equivalent. But given additional assumptions about the role of indicative mood, contextual equivalence can be regained, as is shown in Stalnaker 1975.

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:

(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 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*, $C \models \alpha$ (d and γ) $\beta \Leftrightarrow \alpha\ \gamma\ \beta$.

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

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

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 *dd'* is (somewhat) acceptable in a sentence of the form *α dd' β*
if the 'articulated' competitor *α (d and d') β* is ruled out because *d* is symmetrically transparent,
if for any expression *γ* of the same type as *d*,
C |= α (d and γ) β ⇔ α γ β

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 |= ((p and γ) or q) ⇔ (γ or q)
b. *Claim*: (a) is satisfied if and only if C |= (if not q, p)
c. *Proof*: (i) If C |= (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 |= ((p and γ) or q), and hence C |= (p or q), i.e. C |= (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 general form of *Be Brief*[26], a conclusion which is also suggested by non-presuppositional examples:

(43) #John lives in France and he resides in Europe.

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?

---

[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.

[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?
a. 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 or that he used to smoke - which is in sharp contrast with the data we saw in (44)-(45)[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 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*

[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)-(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?

(ii) a. I really doubt that John used to smoke, has stopped smoking, and runs five miles a day.
b. Is it true that John used to smoke, has stopped smoking, and runs five miles a day?

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 dd' β* is inversely correlated with the acceptability of its 'articulated' competitor *α (d and dd') β*: the more acceptable the latter, the less acceptable the former. As a result, when *α (d and dd') β* is weakly ruled out by the symmetric version of *Be Brief*, *α dd' β* is only weakly acceptable; by contrast, when *α (d and dd') β* is strongly ruled out by the incremental version of *Be Brief*, *α dd' 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 ⊭ 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 ⊭ John is sick	**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 ⊭ John is sick	**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 is sick	**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 is sick and he knows that he is, if he has cancer.	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 *d*$\underline{d}$*d'*β is acceptable because its articulated competitor α *(d and* $\underline{d}$*d') * β is ruled out by a violation if *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 *[*$\underline{Q}$*PP']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 2007a 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.
≠> 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.
=> 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.
? ≠> 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.
? => 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.
=> each of the students who applied is incompetent.
b. nobody who is aware that he is incompetent applied.
≠> each of the students is incompetent
≠> 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,

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

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.

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 20006c 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 1999). 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 1993 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 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, <u>Ada has been eating mud</u>]
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, <u>someone solved the problem</u>]
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, <u>if the problem was easy, someone solved it</u>]
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 1993, 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.
=> 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, x is incompetent]
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

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

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 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 *dd'*, or was fully articulated by a conjunction *(d and 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)]

The facts in (62)a and (63)a are rather unsurprising; they just suggest that *be late* is a presupposition trigger, analyzed as *PP'* 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 *PP'*, 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*

[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.

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 *PP'* 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
=> 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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