# Presupposition Projection: Explanatory Strategies[*]

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## 1 Introduction

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

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

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

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

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

(3) Explanatory Theories[3]

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[2] If $\alpha$ is a string, a string $\beta$ is a 'good final' for $\alpha$ just in case $\alpha\beta$ is a well-formed sentence.
[3] *Yes/No* indicates that different versions of a given theory provide different answers.

| | Templates on dynamic entries *LaCasse 2008* | Symmetric dynamic semantics *Rothschild 2008, this vol.* | Reconstruction of local contexts *Schlenker 2008a* | Trivalent Theories *George 2007, 2008, Fox, this vol.* | Presuppositions *qua* implicatures *Chemla 2008b* | Transparency Theory *Schlenker 2007, this vol.* |
|---|---|---|---|---|---|---|
| Local Contexts? | Yes | Yes | Yes | No | No | No |
| Trivalence? | Yes | Yes | No | Yes | No | No |
| Incremental / Symmetric? | No | Yes | Yes | Yes/No | Yes | Yes |
| Pragmatic? | No | No | Yes | Yes/No | Yes | Yes |

## 2 Problem and Proposal

### *2.1 The Explanatory Problem*

But is there an explanatory problem to begin with? Rooth 1987 and Soames 1989 were in no doubt that there is: dynamic semantics makes it possible to define far too many connectives and operators, including ones that are never attested in natural language. Heim, the pioneer of the approach, endorsed the criticism[4]. But later researchers didn't always agree that there was indeed a serious problem.

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

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

[5] Importantly, the 'explanatory challenge' as stated in (1) does not require that one's algorithm be itself reducible to independently motivated principles - though this would undoubtedly be desirable. The challenge is to find an algorithm which is *general*, and thus which does not require as many axioms as there are connectives and operators. In his commentary, Krahmer rightly observes that there is much less independent evidence for *Be*

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

### *2.2 Applying the Transparency Theory*

Of course to say that the Transparency theory solves the explanatory problem is not to say that it is right. But it has the advantage of being refutable on the basis of data that involve other operators than those that motivated it. To effect the refutation, however, precision is needed. As one applies the theory to a sentence *S*, one must have (1) a clear specification of the syntax of *S*, (2) a list of presupposition triggers that occur in *S*, and (3) a clear notion of equivalence among the modifications of *S* that enter in the algorithm (typically (3) is achieved by making *precise* assumptions about the bivalent truth conditions of the relevant constructions). Beaver (this volume) seeks to apply the theory to sentences involving *because* and *before*, and obtains undesirable results. But his derivation of the predictions is entirely informal, and it fails to satisfy conditions (2) and (3). First, (A) his analysis does not take into account the fact that *because* and *before* are typically presupposition triggers - *p because F* and *p before F* generally presuppose *F*, and it is thus unsurprising that for $F = \underline{q}q'$, *q* should be presupposed as well[6]. Second, (B) even when one disregards this fact, a rigorous application of the theory (i.e. one that is based on the statement of precise truth conditions) is likely to yield much stronger predictions than are obtained by Beaver[7]. Finally, (C) in the

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*Articulate* than for *Be Brief*, and asks whether this does not affect the 'explanatory depth' of the theory; it does, but not in the sense of the 'explanatory challenge' in (1) (similarly, all the 'explanatory theories' listed in (3) must at some point postulate some new principles to account for presupposition projection - but this does not mean they are not explanatory in the sense of (1)).

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

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

[7] Suppose we disregard point (A), and apply the Transparency theory to *(p because $\underline{q}q'$)*. Beaver claims that our prediction is that *if p, then one of the reasons is that q*; for instance, he attributes to our theory the prediction that *Mary is happy because the storm is far away* only presupposes that [BC] *if Mary is happy, then one of the reasons is that there is a storm*. But this is not what our theory predicts. The principle of Transparency requires

that for any appropriate $d$, C |= (p because (q and d)) ⇔ (p because d). And Beaver's condition applied to his own example does not guarantee this. Suppose that Mary lives in a place in which storms can only occur in winter, that there is a storm (= $q$), and that she is happy (= $p$) because of this. Beaver's condition [BC] is thus satisfied. Taking *d = it's winter*, which is entailed by $q$, *Mary is happy because (q and d)* has the same value as *Mary is happy because q*; and the latter is true, since by assumption *Mary is happy because there is a storm* [a complicating matter is that one wouldn't *say Mary is happy because q and d* when $q$ entails $d$, but this does not affect the present point]. Still, the sentence *Mary is happy because d* might well be false: replacing $d$ with its value, we get *Mary is happy because it is winter*, which certainly does not follow from [BC] together with the assumption that *Mary is happy because there is a storm*.

To see what the Transparency theory *does* predict, we need to settle on a semantics for *because*-clauses - by no means a simple matter; the Transparency theory is indeed difficult to apply, but this is because finding clear equivalence conditions for sentences with *because*-clauses is itself a difficult matter. For purposes of illustration, we adopt a simplified Lewisian theory of causation: *p because d* is analyzed as (i) *p and d and ((not d) → (not p)),* where → is a Stalnakerian conditional (Stalnaker 1975), although one which we take to have a contextually given domain restriction. Informally, $F \rightarrow G$ evaluated at w is true just in case the closest world from w which satisfies $F$ and lies in the domain restriction D(w) also satisfies $G$ (D(w) must include C, among others). Given Stalnaker's semantics, (i) can be simplified to *p and ((not d) → (not p)),* and thus the incremental principle of Transparency can be stated as in (ii)a, which can be simplified to (iib) and (iib') (**p** is the set of worlds satisfying $p$):

(ii) a. For any d, C |= (p and ((not d) → (not p))) ⇔ (p and ((not (q and d)) → (not p)))
b. For any d, C ∩ **p** |= ((not d) → (not p)) ⇔ ((not (q and d)) → (not p))
b'. For any d, C ∩ **p** |= ((not d) → (not p)) ⇔ (((not q) or (not d)) → (not p))

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

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

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

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

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

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

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

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

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

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

*Does John know that he is incompetent?* presupposes that *John is incompetent*; and

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

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

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

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

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

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

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

*Who among these ten students knows that he is incompetent?* plausibly yields an inference that *each of these ten students is incompetent*. Why? For technical simplicity, I adopt the analysis of questions of Krifka 2001, which treats questions as functions from their term answers (e.g. *yes* / *no*, or *Mary* / *Sam* / *John*) to full propositions (e.g. *it is raining* / *it is not raining*, or *Mary came* / *Sam came* / *John came*). As a result, two questions are identical just in case they yield the same result at *each* of these arguments. When we combine this criterion with the Transparency theory, it derives the desired results. Let us see how.
-For *yes/no*-questions, we apply Transparency to *? pp'*, which yields a requirement that for every appropriate *d*, *?(p and d)* be contextually equivalent to *?d* - which in turn holds just in case C |= (p and d) ⇔ d, and C |= not (p and d) ⇔ not d. The second condition is redundant, and we obtain the same presupposition as for *pp':* the question presupposes *p*.
-For *wh*-questions, we obtain for the question *who PP'* a requirement that for every appropriate D, *who (P and D)* be contextually equivalent to *who D*. If the individuals in the domain are named by terms $c_1$, $c_2$, ..., this yields a requirement that for every i, C |= (P and D)($c_i$) ⇔ D($c_i$), which in turn holds just in case every individual is presupposed to satisfy *P*. In other words, we predict universal projection in *wh*-questions - which is a plausible result.

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

## 3 Defending the Dynamic Approach

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

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

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

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

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

(4) a. *Triviality:* A is (incrementally) trivial in a sentence S in context C if for any S' formed from S by replacement of material on the right of A with arbitrary grammatically acceptable material that does not refer back anaphorically to A, replacing A by a tautology has no effect on whether C satisfies S'[9].
b. *Local Satisfaction:* Suppose B is a subpart of sentence S. A is locally satisfied at the point where B occurs if A would be (incrementally) trivial if the sentence obtained by replacing B by A in S.

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

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

(i) No sub-DRS is redundant. Formally, if K is the complete DRS structure and K' is an arbitrarily deeply embedded sub-DRS, K' is redundant if and only if $\forall$M, f, (M, f |= K $\rightarrow$ M, f |= K[K' / T]). Here K[K'/T] is a DRS like K except for having the instance of K' replaced by an instance of an empty DRS, and |= denotes the DRT notion of *embedding*.

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

satisfies the sentence. Since the only grammatical material to the right of *Q* is the right parenthesis *)*, we end up with the condition in (5):

(5) Beaver's reformulation applied to *(No P . QQ')*
C |= (No P . Q) ⇔ (No P . T)

It is immediate that in any world w the right-hand side is never satisfied when **P**(w) is non-empty. Assuming that this is the case throughout the context set, Beaver's reformulation predicts that C |= (No P . Q) ⇔ F, where *F* is a contradiction; or in other words, that C |= (Some P . Q). This is of course a much weaker inference than is predicted by the Transparency theory, which derives instead that C |= (Every P . Q); Beaver's 'reformulation' is in fact a different theory. And it is not empirically adequate: as Chemla 2008a shows with experimental means, subjects robustly obtain universal inferences in this case. In another part of his work, Chemla (2006) shows that *in the propositional case* the Transparency theory can be reformulated using tautologies only; Beaver's reformulation might seem to work when one disregards all quantifiers[10]. But when one doesn't, things are not so simple: our particular statement of the principle of Transparency, which requires that C |= (No P . (Q and d)) ⇔ (No P . d) *no matter what d* is, turns out to be crucial in this case (proving the equivalence with Heim's dynamic semantics in a reasonably general case is not quite trivial; in Schlenker 2007, the proof was based on a detailed analysis of the 'tree of numbers' for generalized quantifiers). One can then ask why a conjunction would seem to be crucial to achieve the desired result; it was the goal of 'Be Articulate' to explain this.

Still, parts of the Transparency theory can be imported into a broadly dynamic framework - which makes the debate with dynamic semantics a bit more complicated than was said in 'Be Articulate'. In Schlenker 2008a, I tried to reconstruct a notion of local contexts *without* recourse to context change potentials. The idea was that the local context of an expression *E* is the strongest *c'* such that for any *d* that appears in the position of *E*, one can compute *(c' and d)* rather than *d* without affecting the truth conditions of the sentence. In so doing, one can in a way 'restrict attention' to the domain *c'*, which might simplify the computation of the relevant meanings. Be that as it may, the definition came in a symmetric and in an incremental version; and the latter was shown to be nearly equivalent to the Transparency theory[11] - which in turn guarantees near-equivalence with Heim's theory. So in the end we *can* reconstruct a notion of local context, one which makes it possible to keep some key insights of Stalnaker's (and Karttunen's) work. Importantly, however, we can do so without adopting a dynamic 'semantics' in the strict sense, and without positing context change potentials[12]. So we have at least three ways to reconstruct some version of the dynamic approach without falling victim to the explanatory problem faced by Heim's

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

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

(i) The local context of a propositional or predicative expression *d* that occurs in a syntactic environment *a _ b* in a context C is the strongest proposition or property x which guarantees that for any expression *d'* of the same type as *d*, for all strings *b'* that guarantee that *a d'b'* is a well-formed sentence, $C \models^{c' \rightarrow x}$ a (c' and d') b' ⇔ a d' b' (If no strongest proposition or property x with the desired characteristics exists, the local context of *d* does not exist).

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

analysis; the debate is now open.

## 4 Trivalence Revisited

### *4.1 Trivalent Triggers*

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

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

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

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

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

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

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

### *4.2 Trivalent Operators*

In 1975, Peters wrote a response to Karttunen's work in which he argued that a dynamic analysis was not needed to account for presupposition projection. His key observation was that a directional version of the Strong Kleene logic could derive Karttunen's results (the trivalent approach was further developed in Beaver and Krahmer 2001). Strictly speaking, Peters's paper did not meet the 'explanatory challenge' we laid out at the outset, because he did not derive the truth tables of his connectives from their bivalent behavior together with their syntax (a point that also applies to Beaver and Krahmer 2001). But in 2006, Ben George and Danny Fox independently suggested that the challenge could be met by making explicit the 'recipe' implicit in the Strong Kleene logic, and by making it directional (in fact, they did so before learning of Peters's approach).

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

In this case, the Strong Kleene Logic suffices to derive the desired results. But in its original form, this logic would also make the same predictions for *if (not* $\underline{q}q'$*), (not p)*; in other words, it yields a 'symmetric' account of presupposition projection. Peters, George and Fox propose to make the system asymmetric. There are several ways to do so. Peters stipulated appropriate truth tables. George defines an algorithm that takes as input the syntax and bivalent semantics of various operators, and yields a compositional trivalent logic which is sensitive to the linear order of its arguments[13]. By contrast, Fox proposes to make Strong Kleene incremental by adopting the (non-compositional) device of quantification over good finals.

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

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

incremental trivalent analysis favored by Fox yields the same predictions as the Transparency theory in the propositional case, and weaker ones in the quantificational case (Schlenker 2008b).

The case of the quantifier *no* is particularly interesting, because robust universal inferences were obtained in Chemla's experiment. This might pose a difficulty for the trivalent approach. If we treat indeterminacy as uncertainty, it takes very little to make *(No P. QQ')* false - it is enough to find one P-individual that satisfies both *Q* and *Q'* (as soon as this condition is met, any uncertainty about the value of *QQ'* with respect to other P-individuals fails to have any consequence: the claim is refuted). To give an example, *No student stopped smoking* is predicted to be false in case some student who smoked is now a non-smoker, so trivalent approaches don't predict a universal presupposition in this case. What is true, on the other hand, is that the conditions for *truth* (as opposed to the conditions for *definedness*) entail that every student used to smoke. To see this, note that if any student s didn't smoke before, the value of *QQ'* at s will be #, which will prevent us from being certain that the sentence is true. So *if* the sentence is true, we can infer that every student smoked.

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

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

## 5 Incremental vs. Symmetric

### *5.1 Quantification over good finals*

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

### *5.2 Are symmetric readings real?*

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

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

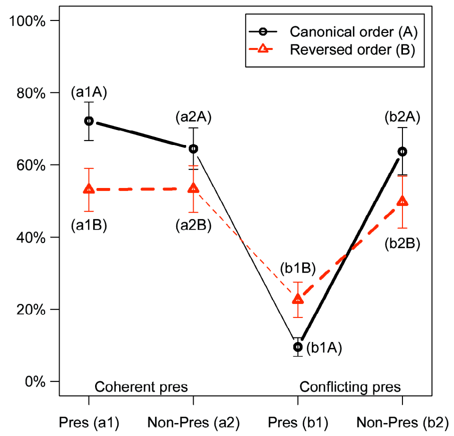
Let us consider a specific example. I argued in 'Be Articulate' that *if not qq', not p* can (marginally) be understood with the presupposition *if p, q* - i.e. with the *incremental* presupposition of *if p, qq'*. In ongoing work conducted by Chemla and myself, we attempt to test this prediction with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

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

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

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

(8) Acceptability judgments for the canonical and reversed orders in conditionals




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

[15]There were 13 subjects and 3 parameters: 1. ±Pres: is a presupposition trigger present? (*yes* in a1-b1 sentences, *no* in a2-b2 sentences ); 2. ±Coherent: is the version of the sentence with the trigger coherent? (*yes* in A sentences, *no* in B sentences); 3. ±Canonical: does the version of the sentence with the trigger have its canonical order? (*yes* in a sentences, *no* in b sentences). Each line in the graph plots the acceptability judgments obtained for the parameters ±Pres and ±Coherent; the continuous line corresponds to +Canonical, and the dotted line corresponds to -Canonical. We asked three questions: (i) With respect to the canonical order (= continuous line), does the presence of a contradictory trigger make the sentence worse? The difference between the results for a sentence and its non-presuppositional control reflects the specific contribution of the trigger to the acceptability of the sentence. Therefore, question (i) was addressed by comparing the slope between the first two points of the line (a1A - a2A) to the slope between the last two points (b1A - b2A) : adding a contradictory trigger should make the sentence far worse than adding a coherent trigger. Technically, we ran a 2x2 ANOVA with factors ±Pres and ±Coherent restricted to the items in canonical order (third factor set to +Canonical). This yields a significant interaction ($F(1,12)=48$, $p<.05$): the presence of a contradictory trigger lowers the acceptability of the sentence. (ii) Same question as (i), but with respect to the reversed order (i.e. the dotted line). Here too the result was positive: we ran the same ANOVA as above, except that it was restricted to the items in non-canonical order (-Canonical), and it yielded a significant interaction ($F(1,12)=6.9$, $p<.05$). (iii) Finally, we wanted to know whether the presence of a coherent trigger was more acceptable in the canonical than in the reversed order (independently from possible influences of any trigger, even a contradictory one, in any given position). We addressed this question by determining whether the preference for the coherent trigger [relative to the incoherent one] in (i) and (ii) was greater in the canonical than in the reversed order. The result was positive: the full 2x2x2 ANOVA yielded a significant interaction ($F(1,12)=25$, $p<.05$). (Thanks to E. Chemla for help with this footnote).

### *5.3 Questions of Implementation*

Rothschild and Beaver correctly note that the symmetric version of the theory requires a refinement. The problem comes up when several triggers appear simultaneously in the sentence: on the symmetric version of the analysis, the presupposition of a given conjunct or disjunct can serve to justify the presupposition of the other, which does not seem right[16].

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

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

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

The modified version of symmetric Transparency predicts this example to be marginally acceptable, while Rothschild's analysis predicts it to be unacceptable. Heeding Krahmer's and Chemla's advice, this is certainly a disagreement that should be settled on experimental grounds.[17]

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

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

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

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

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

Beaver implements this informal suggestion in a modified version of Optimality Theory, and derives undesirable predictions. But for our purposes, it is enough to state the condition as follows: [C] the deviance incurred by a sentence $\alpha\ \underline{d}d'\ \beta$ which violates *Be Articulate* with respect to $\underline{d}d'$ is inversely correlated to the deviance of its articulated competitor $\alpha\ (d \text{ and } \underline{d}d')\ \beta$. In Beaver's example (12b) [*John used to smoke and he has stopped smoking*], the sentence does not violate *Be Articulate* to begin with, hence it is entirely acceptable. (It should also be noted that Beaver's particular implementation is in general ill-defined because the acceptability of $\alpha\ \underline{d}d'\ \beta$ is determined by that of $\alpha\ (d \text{ and } \underline{d}d')\ \beta$, and vice versa; there is no guarantee that a unique solution satisfies this circular dependency. I believe the problem does not arise in [C] above: since *(d*

## 6 The Nature of *Be Articulate*

We could take the principle of Transparency to be a primitive of the theory. But in the article I tried to derive it from two more basic constraints: *Be Brief* and *Be Articulate*, two Gricean[18] maxims of manner (*Be Brief* requires that one *not* pronounce a vacuous conjunct, while *Be Articulate* enjoins the speaker to articulate a complex meaning as a conjunction). While *Be Brief* is not too controversial, the commentators (especially Beaver, Krahmer, Sauerland and van der Sandt) have raised five questions about *Be Articulate*: (i) In what sense is it pragmatic? (ii) Is there independent evidence for it? (iii) Why is it less highly ranked than *Be Brief*? (iv) Can is be computed 'locally' as well as 'globally'? (this question also applies to *Be Brief*); (v) What happens when, for extrinsic reasons, a presupposition cannot be articulated? These are entirely legitimate questions, and the strongest form of the theory cannot be defended without an answer to them.

(i) In a weak sense, *Be Articulate* is pragmatic because it deals with meaning at a post-compositional level (since the principle takes as an input the syntax and bivalent semantics of a sentence). In a strong sense, one would like to show that the principle follows from a theory of rationality[19]. This is a desire, not a result. The best we can do at the moment is argue that there is independent evidence for it.

(ii) In other work (Schlenker 2006), I tentatively argued that some cases of adjectival modification lead to deviance because they violate *Be Articulate*:

(10) a. ? John is an autistic chemist.
b. John is autistic, and he is a chemist.
c. John is an autistic child[20].

This is of course another domain where experimental evidence would be needed. In these cases, one presumably obtains deviance rather than a presupposition because when it is presupposed that, say, John is a chemist, one would save on words by saying *John is autistic* rather than *John is an autistic chemist*. The case of adverbial modification is minimally different because adverbs cannot be predicated of a DP in the absence of a verb; and there I

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*and dd')* never violates *Be Articulate*, the status of $\alpha$ *dd'* $\beta$ is determined by sentences that have a strictly smaller number of unarticulated triggers, which should make circular dependencies impossible.)

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

19 It should be mentioned that the theory of presuppositions-*qua*-implicatures defended in Chemla 2008b might offer a different way of reducing a theory of presupposition to pragmatic principles.

20 Note that the semantic nature of the noun crucially matters, which suggests that the phenomenon does indeed have to do with excessive richness of the meaning expressed. Here are two further examples from Schlenker 2006:

(i) a. ? John is a suicidal oncologist.
b. John is an oncologist and he is suicidal.
c. John is a suicidal student.

(ii) a. ? John is a parricidal linguist.
b. John is a linguist. He is a parricide.
c. John is a parricidal adolescent.

argued that weakened presuppositional effects are indeed obtained, for instance in *None of these ten students came late* (inference: each of these ten students came). These conclusions were confirmed with experimental means in Chemla 2008a, c

(iii) The question of the relative ordering of *Be Brief* and *Be Articulate* is currently open.

(iv) As Sauerland observes, both *Be Articulate* and *Be Brief* are applied globally, i.e. with respect to entire sentences (in the incremental version, the end of the sentence is considered to be unknown, but the principles nonetheless globally - which is the reason we need to quantify over good finals). One could explore a version of the theory in which the same principles can also apply locally - but obviously such a system would have to be constrained. I leave this question open.

(v) The last question is possibly the most difficult one. Chris Potts and Louise McNally both asked about presuppositions that are so complex that they can hardly be articulated in any reasonable way (e.g. presuppositions triggered by discourse particles). Beaver mentions interesting cases in which the syntax makes it difficult to articulate a presupposition as an initial conjunct[21]. Although the derived principle of Transparency can deal with these cases, the pragmatic primitives cannot because there is no articulated competitor to begin with. The theory must be weakened to deal with these examples. One way to do so is to take the pragmatic principles to be encapsulated, in the sense that they don't have access to all the syntactic or morphological facts that rule out some articulated conjuncts (note that a similar move was already made in the theory when we took the algorithm to work as if any meaning whatsoever could be expressed). I believe there are similar cases of encapsulation in the domain of scalar implicatures: for me, *There were delegates from New York at the meeting* yields an inference that *not all* delegates from New York were at the meeting, despite the fact that the corresponding alternative is ungrammatical (*all* - or for that matter *most* - is not an intersective quantifier, and thus one cannot say *There were all delegates from New York at the meeting*). Another way to weaken the theory is to take *Be Articulate* to be pragmatic in the weak sense (= it applies to meanings at the post-compositional level), but not in the strong sense (= it does not derive from a theory of rationality). Either way, the theory must be somewhat modified and rethought.

## 7 The Proviso Problem

All the proposals we have discussed so far - and in particularly all the explanatory theories listed in (3) - predict conditional presuppositions for sentences of the form *p and qq'* or *if p, qq'*. But as was argued in detail in van der Sandt 1992 and Geurts 1996, 1999, these predictions are often too weak, a difficulty that Geurts called the 'Proviso Problem'. The DRT approach to presuppositions is designed to address it. By contrast, dynamic semantics and all the proposals listed in (3) - including the Transparency theory - must rely on additional pragmatic mechanisms to strengthen conditional presuppositions when this is empirically necessary. Since the problem cuts across theories, it was explicitly left out of 'Be Articulate'. But it is only fair that van der Sandt should reiterate his general objections in the context of the present theory[22]. There is admittedly a growing body of work on this topic,

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[21] His example concerned the deviance of *? Mary is thinner than there is a King of France and he is fat*, which should be the 'articulated' form of *Mary is thinner than the King of France is fat*.

[22] A side-issue is that van der Sandt's modal examples, which all involve definite descriptions, turn out to be neutral among the competing theories when one adopts a language with the full power of explicit quantification over possible worlds, as is now standard (Cresswell 1990, Heim 1991). For instance, van der Sandt's example (4) [*If baldness is hereditary, the king of France is bald*] turns out to have a Logical Form in which the world argument of the noun is indexed to the actual world, as in: $[if^{w^*}\ \lambda w$ *baldness is hereditary-w*$]\ [\lambda w$ *the* $^{w^*}$*[king of France] is bald-w]*, where $w^*$ denotes the actual world. With a quantificational analysis of conditionals, Heim's

which could easily be adapted to the present analysis (see for instance Beaver 2001, Heim 2006, Perez Caballo 2007, Singh 2007, and van Rooij 2007); but the problem is still largely open.

The DRT approach championed by van der Sandt is initially in a stronger position to address it. But it raises problems of its own (see also Beaver 2001 for discussion).
(i) First, it does not meet the explanatory challenge that inspired the new theories listed in (3): it crucially depends on 'accessibility relations' that determine possible accommodation sites; and these relations must be stipulated for each connective and operator on a case-by-case basis (for instance, in Geurts 1999 the antecedent of a conditional is accessible to the consequent; but the first element of a disjunction is not accessible to the second - and this difference is stipulated).
(ii) Second, DRT makes incorrect predictions in quantified examples. Due to the fact that a presupposition trigger that contains a bound variable cannot be resolved in a position in which the variable would become unbound, in *[No x: P(x)] QQ'(x)* DRT predicts at most two readings: *[No x: P(x) and Q(x)] Q'(x)* and *[No x: P(x)] (Q(x) and Q'(x))*. Neither reading derives the universal inference that *[Every x: P(x)] Q(x)* - an inference for which Chemla 2008a found strong experimental evidence. Things initially look better for *[Every x: P(x)] QQ'(x)*, where local accommodation could yield *[Every x: P(x)] (Q(x) and Q'(x))*[23], hence the inference that *[Every x: P(x)] Q(x)*. But when we consider questions (*Does each of these ten students know that he is incompetent?*), it becomes non-trivial to determine why the universal clause can somehow leap out of the scope of the question operator.
(iii) Third, there are cases in which conditional presuppositions are quite clearly needed:

(11) If you accept this job, will you let your parents know that you work for a {priest | thug}?
=> If you accept this job, you will work for a {priest | thug}

Global accommodation yields inferences that are too strong; and here too, local accommodation fails to explain how the conditional clause can somehow leap out of the scope of the question operator.

I believe that DRT could be re-formulated so as to address the explanatory problem (as well as some of the other difficulties); but I also suspect that key ideas of the theories listed in (3) will have to be borrowed in order to do so.

As this discussion makes clear, quite a few issues are still open for the Transparency theory. But I hope that the present debate suggests that there are now many interesting ways to address the explanatory challenge that motivated it.

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theory (1983) would presumably predict a presupposition that *for every accessible possible world w, there is exactly one king of France in the actual world w**. Since the quantification is vacuous, we get an *unconditional* presupposition that there is a king of France. This is a side-issue, however, because (i) this line of argument does not extend to non-intensional examples, and (ii) in any event, other intensional examples can be constructed to make van der Sandt's point without recourse to definite descriptions.

[23] Obtaining this representation isn't quite trivial, because DRT posits a general preference for accommodation at the highest possible site - which would typically yield *[Every x: P(x) and Q(x)] Q'(x)*.

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