

# On the Calculation of Local Implicatures

Yael Sharvit and Jon Gajewski

University of Connecticut

## 1. The phenomenon

Some propositional attitude verbs, such as *certain*, have local implicatures (Chierchia 2004, 2006), sometimes in addition to global ones. The local implicature of (1a) is given in (1b), and its global implicature is given in (1c). (1b) entails (1c).

- (1) a. John is certain that the boss or her assistant have disappeared.  
b. John's certainty: the boss or her assistant, but not both, have disappeared.  
c. It is possible, for all John knows, that the boss and her assistant have not both disappeared.

The term "local" refers to the fact that the implicature is "embedded". That is to say, within the scope of the attitude verb *certain*, the implicature in (1b) is identical to the one the embedded clause has when it appears unembedded, as in the case of (2a), which has the implicature in (2b).

- (2) a. The boss or her assistant have disappeared.  
b. The boss or her assistant, but not both, have disappeared.

By contrast, the global implicature in (1c), though entailed by (1b), does not have a similar corresponding implicature of the embedded clause when it appears unembedded. For this reason, the local/global distinction is relevant only in complex sentences. In simplex sentence such as (2a) the local and global implicatures are one and the same.

The fact that (1a) has the local implicature in (1b) is not under dispute. What is often debated is the source of (1b). According to some authors (e.g., Russell 2006), although (1b) is "local" in the sense that it is identical to the implicature of (2a), it is derived strictly in the pragmatic component, that is to say, after the meaning of the entire sentence in (1a) has been computed. Other authors (most notoriously, Chierchia 2004) argue that the local implicature in (1b) requires access to the meaning of the embedded clause in (1a) before the computation of the meaning of the entire clause is completed, and therefore its derivation is done alongside the compositional computation of the meaning of (1a).

The primary goal of this paper is to argue for the latter approach. For ease of reference, we call the former approach to local implicatures 'non-grammatical' and the latter approach to local implicatures 'grammatical' (see Russell 2006). The paper also addresses some challenges for the grammatical approach, which predicts a correlation between NPI-licensing and cancellation of local implicatures. The most interesting of these challenges is perhaps the one posed by the fact that interrogative clauses produce local implicatures and, at the same time, license NPIs.

## 2. More facts about local implicatures

Any theory of local implicatures must explain the following facts. First, local implicatures can often be cancelled explicitly with the help of an overt expression that doesn't affect global implicatures. This is illustrated in (3) for the implicatures induced by *or*. The canceling expression is *or both*. (3a) has only the global implicature in (3c), but not the local one in (3b).

- (3) a. John is certain that the boss or her assistant, or both, have disappeared.  
b. John's certainty: the boss or her assistant, but not both, have disappeared.  
c. It is possible, for all John knows, that the boss and her assistant have not both disappeared.

Implicatures in simplex sentences, where the global/local distinction plays no role, can, of course, be explicitly cancelled too, as in the simplex sentence in (4a), which doesn't have the implicature in (4b).

- (4) a. The boss or her assistant, or both, have disappeared.  
b. The boss or her assistant, but not both, have disappeared.

The point is that when the global/local distinction is significant (as in (3)), there are expressions that cancel one type of implicature but not the other.

Another property of local implicatures is that they are cancelled by downward entailing (henceforth, DE) operators, as illustrated by (5a). (5b) is no longer implicated, though (5c) is valid.

- (5) a. John doubts/isn't certain that the boss or her assistant have disappeared.  
b. John's doubt: the boss or her assistant, but not both, have disappeared.  
c. It is possible, for all John knows, that the boss and her assistant have not both disappeared.

Again, it is important to bear in mind that implicatures in simplex sentences (where the global/local distinction plays no role) can be cancelled in the same way (as illustrated by (6a), which lacks the implicature in (6b)). The point is, again, that when the local/global distinction does play a role, DE operators cancel only local implicatures. And indeed, the oddity of (7) correlates with the fact that (5a) has the same global implicature as (1a).

- (6) a. It isn't the case that the boss or her assistant have disappeared.  
b. The boss and her assistant both disappeared.  
(7) #John doubts/isn't certain that the boss or her assistant, or both, have disappeared.

In addition to the correlation between *or both*-type cancellation and cancellation by DE operators, there is a correlation between cancellation by DE operators and NPI-licensing, as illustrated in (8).

- (8) John doubts/isn't certain that he will ever finish his dissertation.

In the next section we spell out how the two approaches work, and why we believe that the facts discussed above suggest that the grammatical approach to local implicatures is superior.

### 3. Two approaches to local implicatures

#### 3.1. *The non-grammatical approach*

Within this approach, all scalar implicatures are thought to be the result of purely Gricean (i.e., "conversational") principles. The idea is that when a hearer compares a sentence with a scalar item to its alternatives (created by replacing that item with all the items on the relevant scale), she assumes that any stronger alternative to the assertion must be false. This theory correctly predicts (2a) to have the implicature it has (as illustrated in (9a)), and it also predicts the negation of (2a) to lose this implicature (as illustrated in (9b)).

- (9) a. The boss or her assistant have disappeared.  
Alternatives: {the boss or her assistant disappeared, the boss and her assistant disappeared}  
Assuming the stronger alternative to the assertion is false creates the implicature:  
Only one of them disappeared.  
b. It isn't true that the boss or her assistant have disappeared.  
Alternatives: {it isn't true that the boss or her assistant have disappeared, it isn't true that the boss and her assistant have disappeared}  
Since there is no stronger alternative to the assertion, the following implicature is not created:  
It isn't true that only one of them disappeared.

However, as pointed out by Chierchia, this algorithm fails when we consider implicatures in the scope of attitude verbs, as illustrated in (10). The algorithm correctly predicts (1a) to have the weak implicature in (1c), but fails to predict the strong implicature in (1b).

(10) John is certain that the boss or her assistant have disappeared.

Alternatives: {John is certain that the boss or her assistant disappeared, John is certain that the boss and her assistant disappeared}

Assuming that ‘John is certain that the boss and her assistant disappeared’ is false leads to the following implicature:

It is possible, for all John knows, that the boss and her assistant have not both disappeared.

The challenge posed for proponents of this view is then clear: What would it take (i.e., what additional assumptions are needed) to salvage the view that all implicatures are the result of conversational considerations only (which come into play only when the computation of the meaning of the entire sentence is complete)? The most serious attempt that we are aware of to save this view is due to Sauerland (2004a). In that work, Sauerland doesn’t discuss scalar items in the scope of attitude verbs, but rather scalar items in the scope of other scalar items. Chierchia takes these cases too to be instances of local implicatures. To see why, consider (11), with the scalar items *or* and *some*.

(11) Kai ate the broccoli or some of the peas.

One of the implicatures of (11) is ‘Kai didn’t eat all of the peas’. It might be thought of as “local” because it is identical to the implicature of the simplex sentence *Kai ate some of the peas*. Suppose we follow Sauerland’s suggestion and consider all the alternatives created by replacing at least one scalar item with one of its stronger alternatives. We then get the following set of alternatives: {Kai ate the broccoli and all of the peas, Kai ate the broccoli and some of the peas, Kai ate the broccoli or all of the peas}. Negating these produces the following set of implicatures: {it isn’t the case that Kai ate the broccoli and all of the peas, it isn’t the case that Kai ate the broccoli and some of the peas, it isn’t the case that Kai ate the broccoli or all of the peas}. None of these is the implicature we are after.

To solve this problem Sauerland proposes that the scale associated with *or* is not merely  $\langle \text{or}, \text{and} \rangle$  but rather the scale in (12), where A and B are both weaker than ‘A and B’, both stronger than ‘A or B’, but are not ordered with respect to each other.

(12) ‘A and B’  $\gg$  A, B  $\gg$  ‘A or B’

This renders ‘Kai ate all of the peas’ an alternative to (11), and its negation, an implicature of (11). The conclusion is, for Sauerland, that here what appears to be a local implicature (in the sense that it is identical to the implicature generated a corresponding simplex sentence) is derived by non-grammatical means. The interesting question that arises is whether a relatively simple change in the set of assumptions (i.e., changing our assumptions regarding what the alternatives to *or* are) would suffice to make the right predictions for (1a) (i.e., for scalar items in the scope of attitude verbs) as well.

Sauerland’s own conclusion (in Sauerland (2004b)) is that this is not possible. The new scale for *or* clearly doesn’t generate the implicature in (1b) by means of simply negating the relevant alternatives (i.e., ‘John isn’t certain that the boss disappeared’ and ‘John isn’t certain that her assistant disappeared’). However, one can still claim that for certain sentence-embedding verbs (i.e., speech act verbs) the non-grammatical approach suffices, by taking into account more general pragmatic reasoning. For example, one typical reason for asserting (13) is that Bill made an utterance equivalent to (2a), and that Bill’s reasoning is similar to the reasoning of any person uttering (2a).

(13) Bill said that the boss or her assistant have disappeared.

But Sauerland acknowledges that it is unclear whether such reasoning can plausibly be extended to cases of sentence-embedding predicates that describe mental attitudes as opposed to speech acts.

A different position is taken in Russell (2006) (see also van Rooij and Schulz 2004). The example originally used by Chierchia (unlike our (1a)), involves the attitude verb *believe* (and the scalar item *some*, not *or*, but we believe this latter fact to be of no crucial importance). Consider (14).

(14) John believes that the boss or her assistant have disappeared.

Generalizing Russell's claim regarding *some*, a background assumption made by most speakers is that John is opinionated regarding the strong alternative to the embedded clause; that is to say, he either believes the proposition 'the boss and her assistant disappeared' or its negation. And indeed, this background assumption, (14), and the negation of the alternative to (14) (i.e., 'it isn't the case that John believes that the boss and her assistant disappeared') together entail 'John believes that the boss or her assistant, but not both, disappeared'. Notice, however, that this background assumption is not always present, and is probably tied to the meaning of *believe*, which is a Neg-raising predicate (as evidenced by the fact that *John doesn't believe it's raining* implies that John believes it's not raining). Indeed, beginning with the work of Bartsch (1973), many researchers take this assumption to be not simply a background assumption, but a lexical presupposition of *believe*. On the other hand, *certain*, the verb we used in (1a), is not a Neg-raising predicate (as evidenced by the fact that *John isn't certain it's raining* doesn't imply that he is certain it's not raining; it is fully consistent with a situation where John entertains both possibilities). Therefore, there is no motivation to assume 'John either believes that the boss and her assistant disappeared or he believes that it isn't the case that the boss and her assistant disappeared' to be a background assumption of (1a). And yet, (1a) has the local implicature in (1b).

It is perhaps not impossible to come up with some more changes or additions to our set of assumptions in order to salvage the non-grammatical view (Benjmain Spector, p.c.). It seems to us that such changes/additions would lack independent motivation, and we do not see why that would be preferable to simply admitting that the non-grammatical view, while successful in accounting for various implicatures, is not sufficient, and has to be supplemented with a grammatical component.

### 3.2. The grammatical approach

In Chierchia's grammatical system scalar items are lexically associated with certain implicatures, and the compositional semantics generates pairs of meanings in every step. The first member of each pair is the standard meaning, the second one contains the implicature lexically associated with the scalar item. The stronger member of the pair is always preferred over the weaker one. Because the procedure relies on relative strength, in many simplex cases (e.g., (15a) and its negation (16a)), this procedure amounts to the non-grammatical procedure. But in complex cases (e.g., (17a) and its negation (18a)), the grammatical procedure is genuinely different from the non-grammatical procedure (as the alternatives are genuinely different), and the predictions are, of course, strikingly different.

(15) a. The boss or her assistant have disappeared.

b. <the boss or her assistant disappeared; the boss or her assistant, but not both, disappeared>  
(2<sup>nd</sup> member stronger than 1<sup>st</sup>, therefore 2<sup>nd</sup> member preferred)

(16) a. It isn't true that the boss or her assistant have disappeared.

b. <it isn't true that the boss or her assistant disappeared; it isn't true that the boss or her assistant, but not both, disappeared>  
(1<sup>st</sup> member stronger than 2<sup>nd</sup>, therefore 1<sup>st</sup> member preferred)

(17) a. John is certain that the boss or her assistant have disappeared.

b. <John is certain that the boss or her assistant disappeared; John is certain that the boss or her assistant, but not both, disappeared>  
(2<sup>nd</sup> member is stronger than 1<sup>st</sup>, therefore 2<sup>nd</sup> member preferred)

(18) a. John doubts/isn't certain that the boss or her assistant have disappeared.

b. <John isn't certain that the boss or her assistant disappeared; John isn't certain that the boss or her assistant, but not both, have disappeared>  
(1<sup>st</sup> member is stronger than 2<sup>nd</sup>, therefore 1<sup>st</sup> member preferred)

Notice that the grammatical approach, in addition to predicting local implicatures and their cancellation by DE operators, also makes the following predictions. It predicts that in complex sentences (where the local/global distinction plays a role; see section 2), *or both* cancels (1b)/(3b). For example, in (3a) the following pair is generated: <John is certain that the boss or her assistant but not both, or both the boss and her assistant disappeared; John is certain that the boss or her assistant but not both, or both the boss and her assistant – but not both (the boss or her assistant) and (the boss and her assistant) – disappeared> (cf. Fox 2004). The two members are equivalent. This allows John to entertain the *both*-possibility. Secondly, in conjunction with some version of Grice's maxim of brevity, it predicts the oddity of *or both* under DE operators. For example, in (7), too, the two members of the generated pair are equivalent, but adding *or both* doesn't add anything to the meaning the sentence has without *or both* (any world where neither the boss nor his assistant disappeared is also a world where one of them didn't disappear). Thirdly, it predicts correlation between cancellation of local implicatures and NPI-licensing (which itself requires a DE environment).

Importantly, the non-grammatical view doesn't explain these facts as neatly (if at all). It remains a puzzle, for example, why *or both* cancels (1b)/(3b). Consider (3a) again. Even if we made the assumption (which we think is unmotivated, see 3.1) that *certain* comes with a presupposition similar to that of *believe*, that presupposition should be active in (3a), and we would expect (3b) to emerge in the same way it emerges from (1). However, because we think the assumption that *certain* has the same presupposition as *believe* is unmotivated, we also think that the non-grammatical theory doesn't really explain local implicatures, and therefore it doesn't explain either their cancellation (by *or both* or by DE operators) or the correlation between cancellation by DE operators and NPI-licensing.

In the next sections we look at some potential problems or counter-examples to this approach.

#### 4. Some apparent exceptions

As noted by Simons (2006) (see also Russell 2006), some factive attitude verbs show a pattern different from *certain*. (19a) implicates (19b) but not (19c). If we try to cancel (19c) with *or both* we get an odd result (see (20)). And unlike *certain*, *sorry* is a licenser of NPIs (see (21)).

- (19) a. John is sorry that the boss or her assistant have disappeared.  
 b. John believes that the boss or her assistant, but not both, have disappeared.  
 c. John is sorry that the boss or her assistant, but not both, have disappeared.

(20) #John is sorry that the boss or her assistant, or both, have disappeared.

(21) John is sorry that he ever started his dissertation.

(cf. \**John is certain that he ever started his dissertation*)

If we adopt the semantics for *sorry* in (22) (according to which it presupposes that the subject believes the complement, and asserts that the subject wants the negation of the complement), the pair of meanings associated with *John is sorry that the boss or her assistant have disappeared*, according to Chierchia's system, is the one given in (23) ( $\text{DOX}_w(x)$  is the set of  $x$ 's doxastic alternatives in  $w$ , and  $\text{BUL}_w(x)$  is the set of  $x$ 's bulletic alternatives in  $w$ ).

(22)  $\llbracket \text{sorry} \rrbracket = [\lambda p \in D_{\langle s, t \rangle} \cdot \lambda x \in D_e \cdot \lambda w \in W : \text{(i) } p(w) = \text{True, and (ii) } \text{DOX}_w(x) \subseteq \{w' \in W : p(w') = \text{True}\} \cdot \text{BUL}_w(x) \subseteq \{w' \in W : p(w') = \text{False}\}]$

(23) a.  $\langle [\lambda w \in W : \text{(i) } \text{boss}_w \text{ or } \text{assistant}_w \text{ disappeared}_w \text{ and (ii) } \text{DOX}_w(J) \subseteq \{w' \in W : \text{boss}_{w'} \text{ or } \text{assistant}_{w'} \text{ disappeared}_{w'}\} \cdot \text{BUL}_w(J) \subseteq \{w' \in W : \text{boss}_{w'} \text{ or } \text{assistant}_{w'} \text{ didn't both disappear}_{w'}\}], [\lambda w \in W : \text{(i) } \text{boss}_w \text{ or } \text{assistant}_w \text{ disappeared}_w \text{ and } \text{boss}_w \text{ and } \text{assistant}_w \text{ didn't both disappear}_w \text{ and (ii) } \text{DOX}_w(J) \subseteq \{w' \in W : \text{boss}_{w'} \text{ or } \text{assistant}_{w'} \text{ disappeared}_{w'} \text{, and } \text{boss}_{w'} \text{ and } \text{assistant}_{w'} \text{ didn't both disappear}_{w'}\} \cdot \text{BUL}_w(J) \subseteq \{w' \in W : \text{it isn't the case that: } \text{boss}_{w'} \text{ or } \text{assistant}_{w'} \text{ disappeared}_{w'} \text{ and } \text{boss}_{w'} \text{ and } \text{assistant}_{w'} \text{ didn't both disappear}_{w'}\}] \rangle$

b.  $\langle \text{John is sorry that the boss or her assistant disappeared; John is sorry that the boss or her assistant, but not both, have disappeared} \rangle$

Neither member of the pair is stronger than the other, because in the first member the assertion is stronger and in the second member the presupposition is stronger. Thus, Chierchia's system doesn't predict what (19)-(21) show.

We think this is simply an indication that the grammatical approach requires the following amendment: pairs of meaning are generated not only in the course of generating assertions, but also in the course of generating presuppositions. The reason for this is linked to the reason why *sorry* licenses NPIs at all. As is well known (see von Stechow 1999 among many others), *sorry* is not DE in the strict sense (as evidenced by the fact that (24a) doesn't entail (24b)), but it is (what von Stechow calls) Strawson DE, in the sense of (25) (as evidenced by the fact that (24a) and (24c) together entail (24b)).

(24) a. John is sorry that Mary hates professors.

b. John is sorry that Mary hates linguistics professors.

c. John believes that Mary hates linguistics professors.

(25) f Strawson-entails g iff for every X such that g(X) and f(X) are defined,  $f(X) \implies g(X)$

(f and g are functions, ' $\implies$ ' stands for cross-categorial entailment; see von Stechow 1999)

If we adopt the assumption that NPI-licensing requires Strawson DE-ment, we in fact adopt a much more general assumption, namely, that Strawson-entailment is the kind of entailment used in natural language in general. Therefore, assuming a multi-tiered version of Chierchia's algorithm for local implicatures is neither unreasonable nor implausible (in fact, it is expected). Thus, we propose that a pair of meanings is generated separately for presuppositions and assertions. In each case, the stronger member is selected. Under this view, the relevant pairs are as in (26).

(26) John is sorry that the boss or her assistant have disappeared.

Presupposition pair:

<John believes that the boss or her assistant disappeared, John believes that the boss or her assistant, but not both, disappeared>

(2<sup>nd</sup> member stronger than 1<sup>st</sup>)

Assertion pair:

<John wants [NOT the boss or her assistant disappeared]; John wants [NOT the boss or her assistant but not both disappeared]>

(1<sup>st</sup> member stronger than 2<sup>nd</sup>)

Chierchia's account of the local implicature of *certain* and its account cancellation is unaffected by our proposed qualification. This is because "classical" entailment implies Strawson-entailment.

Simons discusses another interesting apparent counter-example to the grammatical view, namely, *discover*. We illustrate her observation using (27) (and not her own example).

(27) John discovered that the boss or her assistant have disappeared.

According to Simons, (27) can be felicitous and true in a scenario where the boss or her assistant, but not both, have disappeared, yet John – who previously believed neither disappeared – reached the conclusion that they both did. This fact doesn't conflict with the multi-tiered version of the grammatical approach. Presumably, at the presupposition tier the following pair is generated: <John had not been aware that the boss or her assistant had disappeared; John had not been aware that the boss or her assistant, but not both, had disappeared>. The first member of this pair is stronger than the second and is, therefore, selected as the presupposition of (27). So, an utterance of (27) requires its context to entail the first member. A context in which exactly one of them actually disappeared but John is erroneously convinced that both disappeared meets this requirement. So, the participants of a conversation in which (27) is uttered are free to conclude that John came to believe that both disappeared, if this is what the context implies. Thus we see that Simons's observations are compatible with the predictions of our amended version of the grammatical approach to implicatures.

It is worth noting that the non-grammatical approach is not designed to predict such nuances, as all the considerations are done outside the semantic computation.

## 5. Interrogative clauses

Interrogative clauses are an especially interesting challenge for the grammatical approach for the following reasons: (a) questions are not DE (in any intuitive sense of the term, as evidenced by the fact that (28a) doesn't "entail" (28b); for discussion, see Guerzoni and Sharvit 2007), yet they produce local implicatures (as evidenced by the well-formedness of (29)) and, at the same time, they license NPIs (as evidenced by (30)); (b) not all question-embedding predicates allow their embedded question to produce local implicatures (as suggested by the contrast in acceptability between (31), with question-embedding *know*, and (32), with question-embedding *surprise*).

- (28) a. Which employees owned a car?  
       b. Which employees owned an Italian car?  
 (29) Which employees did the boss or her assistant(, or both,) talk to?  
 (30) Which employees were ever sent to Paris?  
 (31) John knows which employees the boss or her assistant, or both, talked to.  
 (32) #It surprised John which employees the boss or her assistant, or both, talked to.

The challenge is even greater when we consider the fact that proposition-taking *surprise* contrasts with question-taking *surprise* in NPI-licensing (see (33)-(34), but neither one of them supports local implicatures (as shown by the unacceptability of both (32) and (35)).

- (33) John is surprised that Mary ever owned a car.  
 (34) #It surprised John which employees ever owned a car.  
 (35) #John is surprised that the boss or her assistant, or both, talked to Mary.

One could take all of this to mean that whatever correlations we found, that supported the grammatical view to local implicatures, break down when we consider questions, and that this should lead us to doubt the validity of the proposal altogether. We now show that under a particular approach to NPI-licensing in questions, the facts described here are not as surprising as they might seem at first sight.

According to Guerzoni and Sharvit (2007), weak NPIs (*any*, *ever*) are licensed only in those questions that are strongly exhaustive (henceforth, "strong"), and not by DE operators (as questions are not, as we saw, DE environments). A "strong" question is a question that makes reference to both "positive" and "negative" possible answers. For example, to know a question in the "weak" sense is to believe all the possible answers to it that happen to be true, and to know it in the "strong" sense is to believe that the set of true possible answers to it equals the set of possible answers that are in fact true. Thus, one can know which students left in the weak sense (by believing that Sue and Pam left, if they indeed left), or in the strong sense (by believing that Sue and Pam are they only ones who left). *Know*, as we just illustrated can be construed as either "weak" or "strong", but some predicates have one meaning but not the other. *Wonder* is strictly "strong" (it is hard to imagine a situation where one would want to believe the true possible answers to a question while remaining agnostic about the false ones), and *surprise* seems to be strictly "weak" as evidenced by (36) (see Heim 1994).

- (36) #Although John expected the students who had actually left to leave, it still surprised him which students left, because he also expected Bill, who hadn't left, to leave.

As observed by Guerzoni and Sharvit, *wonder*-type verbs license NPIs, *know*-type verbs do so only in their "strong" guise (and speakers sometimes have trouble deciding which of the two readings is the intended one), and *surprise*-type verbs do not license NPIs in embedded questions at all.

- (37) a. John wondered which students had ever been to Paris.  
       b. ??John knows which students had ever been to Paris.  
       c. \*It surprised John which students had ever been to Paris.

Crucially, the fact that NPIs, as well as "local" implicatures, are licensed in questions, is not a problem for the grammatical view of local implicatures: NPIs are licensed via "strength", not DE-ment, and

therefore there is nothing to prevent local implicatures from arising. But how do they arise in interrogative clauses? We argue that they can arise as long as they are consistent with whatever other implications the entire sentence has. For example, the assertion tier of *I wonder which employees the boss or her assistant talked to* has the pair of meanings in (38a), and its presupposition tier has the pair of meanings in (38b).

- (38) a. <(I wonder) which employees the boss or her assistant talked to; (I wonder) which employees the boss or her assistant, but not both, talked to>  
 b. <I believe there are some employees that the boss or her assistant talk to; I believe there are some employees the boss or her assistant, but not both, talked to>

My wanting to know which employees are such that the boss or her assistant, but not both, talked to is consistent with my belief that there are some employees that the boss or her assistant, but not both, talked to. Thus, even though in the assertion pair neither member is stronger than the other (as the reader can verify), the second member of the presupposition pair is stronger than the first, so the implicature persists in the assertion pair (because it doesn't conflict with it, see section 4).

Things are different in the *surprise* case. Guerzoni and Sharvit attribute the fact that question-taking *surprise* cannot license NPIs to the fact that it is inherently “weak” (i.e., does not allow “strong” readings of the embedded question). By contrast, proposition-taking *surprise* is Strawson DE (just like *sorry*, see section 4), and as such, licenses NPIs. Just like *sorry*, proposition-taking *surprise* (whose meaning is very similar to that of *sorry*) doesn't produce a local implicature in its assertion (hence the unacceptability of (35), cf. (20)). Question-taking *surprise*, on the other hand, doesn't produce local implicatures for an entirely different reason, namely, that such an implicature would be inconsistent with the implicature produced in the presupposition tier. To see this, consider (39), in a context where the boss or her assistant (but not both), talked to the employee Fred and the employee Sam.

- (39) a. <In the past, John expected NOT [the boss or her assistant talked to Fred and Sam]; In the past, John expected NOT [the boss or her assistant, but not both, talked to Fred and Sam]>  
 b. <John now knows that the boss or her assistant talked to Fred and Sam; John now knows that the boss or her assistant, but not both, talked to Fred and Sam>

(39a) is the assertion tier and (39b) is the presupposition tier. Neither member in either tier is stronger than the other member. Consider (39a) first. The first member is consistent with only the boss talking to Fred only (which is not required by the second member). The second member is consistent with a context where John expected both the boss and her assistant to talk to both Fred and Sam (which is inconsistent with the first member). Turning to (39b), the first member is consistent with a context where both the boss and her assistant talked to both Fred and Sam (which is inconsistent with the second member), and the second member is consistent with a context where both the boss and her assistant talked to Fred, but not to Sam (which is inconsistent with the first member). In short, there is no way for the implicature under discussion to be generated: not as a result of relative strength in the assertion tier, and not as a result of “spilling” from the presupposition tier into the assertion tier.

## 6. Not all DE operators cancel implicatures

Finally, we would like to discuss a case of where we agree with other authors regarding the status of, what seems to be, a local implicature. This is the fact (pointed out in Levinson (2000)) that the antecedent of *if... then...* clauses (a DE environment) seems to produce local implicatures.

- (40) If some students apply for funding, we'll be all right, but if all students apply, we'll be in trouble.

The most natural way to understand (40) is “if some, though not all, students apply...”. In Chierchia (2006), following an idea due to Fox (2003), it is suggested that this implicature is produced thanks to the presence of a silent operator that guarantees that the implicature invoked by *some* does not disappear (despite the potential canceling effect of the ‘if...then...’ operator). We believe that such a move weakens the theory considerably (as all the predictions of the theory regarding the properties of

local implicatures as they are described in section 2 would be hard to maintain). An explanation that poses no such threat is the one suggested in Chierchia (2004), according to which what is responsible for the local implicature is the restriction of the universal quantifier over worlds (which, presumably, comes from the meaning of ‘if... then...’). This restriction is contextual, and in (40) it allows only worlds consistent with the implicature. We think this explanation is preferable not only because it is better from a theoretical point of view, but also an empirical one, because the antecedent can produce such an implicature only if the consequent introduces the strong alternative to *some*, namely, *all*.

(41) If some students apply for funding we’ll support them, but if no one applies we’ll use the money for other purposes.

(41) doesn’t imply ‘if some though not all...’, but a theory along the lines of Chierchia (2006) predicts this to be a possible interpretation. One might legitimately raise the following question. Why can’t the universal world quantifier associated with *certain* be contextually restricted in the same way (and provide an explanation for (1b))? Notice that this indeed doesn’t happen, as shown by the oddity of (42), whose first conjunct introduces the strong alternative to *or*, namely, *and*.

(42) John is certain that the boss and her assistant have both disappeared, but he is not certain that the boss or her assistant have disappeared at all.

The reason for this difference between *if... then...* and *certain* might be attributed to the assumption that the *if*-clause itself serves as the restrictor of the silent universal in the *then*-clause, while the structure of *certain*-clauses is entirely different.

## 7. Conclusion

There is no dispute that many implicatures, scalar and other, arise as a result of pragmatic reasoning alone, after the semantic computation is completed. However, the existence of local implicatures of the sort illustrated in (1a), and their cancellation properties (see the facts discussed in section 2), strongly suggest that they cannot be derived in the same fashion. A theory that allows the generation of implicatures to be part of the meaning computation process seems more promising.

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