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Implicated Presuppositions

1 Introduction

Presuppositions are an important means to structure information. They allow speakers to communicate more than one proposition with a single sentence, and furthermore indicate which of the propositions communicated is the main assertion and which provide a background for the main assertion. For example, (1) entails both that John has been smoking since yesterday, and that he had been not smoking for some time until yesterday.

- (1) John began smoking yesterday.

The analysis of presuppositions that is currently standard is, for example, presented in textbooks by Heim and Kratzer (1998) and, more extensively, Kadmon (2001). This account holds that presuppositions are modelled semantically as truth value gaps with a set of special pragmatic rules that tell us how to link these truth-value gaps to the common ground (Stalnaker 1973, 1978). Within this model, the lexical entries of certain words, the *presupposition triggers* like the change of state verb *begin* in (1), contain as part of their lexical entry the fact that they trigger a presupposition and what the content of this presupposition is. Technically, this is marked by indicating the domain of the function that captures the meaning of a word separate from its truth-conditional contribution. In the following, I use a notation using fractions, where the statement above the fraction bar describes the domain and that below the fraction bar the value is given. This is illustrated by the lexical entry for *begin* in (2):

- (2) $\llbracket \text{begin} \rrbracket = \lambda P \lambda x \frac{x \text{ did not } P \text{ in the past}}{x \text{ is doing } P \text{ at present}}$

Heim and Kratzer (1998) instead use a notation where the domain condition and the value are given on a single line separated by dots, which is of course fully equivalent. The advantage of the fraction notation is that it is more transparent.

On the standard analysis of *begin*, the lexical entry encodes both the content of its presupposition and its presuppositionality. The content of the presupposition

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of *begin* distinguishes it from *continue*, which in difference to *begin* entails that the present state already held in the past. The presuppositionality of the specific part of content distinguishes (2) from the lexical entries in (3) where presupposition and assertion are switched in (3a), while (3b) has no presupposition.

- (3) a. $\llbracket \text{begin}' \rrbracket = \lambda P \lambda x \frac{x \text{ is doing } P \text{ at present}}{x \text{ did not do } P \text{ in the past}}$
 b. $\llbracket \text{begin}'' \rrbracket = \lambda P \lambda x \frac{x \text{ did not do } P \text{ in the past} \wedge x \text{ is doing } P \text{ at present}}$

Clearly analyses of presuppositions that place less of a burden on the lexicon are preferable. One such proposal is in essence due to Heim (1991). She argues that the a non-uniqueness presupposition of the indefinite article is not inherent in its lexical entry, but instead is derived in a fashion analogous to implicatures. My goal in this paper is to argue that this proposal should be extended to a number of cases other than the indefinite article. Heim's concern is to explain facts like the oddness of (4).

- (4) #A father of the victim arrived at the scene.

To this end, Heim (1991) proposes a theoretical revision of the proposal of Hawkins (1981) based on scalar implicature. Since the definiteness presupposition of *the* is not informative, Heim proposes that a new version of the quantity maxim of Grice be formulated that applies to presuppositions. This she then uses to derive the effect in (4).

1.1 Abusch's Proposal

Heim's proposal is not the only, first, or most ambitious attempt to derive presuppositions or presuppositionality. Stalnaker (1974) already presents a proposal for the derivation of the presuppositionality of the factive entailment of *know*. An important recent paper by Abusch (2005) discusses Stalnaker's proposal and some related ones, as well as making a new proposal. However, as I argue in this section, even Abusch's proposal faces a problem.

Abusch assumes that certain lexical entries are associated with a set of alternatives. Specifically, she propose that the pairs in (5) are alternatives.

- (5) a. {stop, continue}
 b. {win, lose}
 c. {be right, be wrong}
 d. {know, be unaware}

On the basis of these lexical alternatives, Abusch defines an alternative sentence as in standard alternative semantics (Hamblin, 1973): An alternative sentence there is derived from the original sentence by one or more replacements of one lexical item of one of the sets in (5) with an element of its alternative set. For example, a sentence with *know* is assigned the alternative set in (6b).

- (6) a. *x knows p*
 b. $\{x \text{ knows } p, x \text{ is unaware } p\}$

Finally, Abusch assumes that the disjunctive closure of the alternative set is always presupposed. In this way, she derives from (6a) the presupposition *p* as the disjunction in (7), assuming here that *x is unaware that p* is equivalent to (*p* and *x* doesn't believe *p*).

- (7) $(p \text{ and } x \text{ believes } p) \text{ or } (p \text{ and } x \text{ doesn't believe } p) = p$

Further applications of Abusch's idea to *stop* and *win* are shown in (8). The disjunctive statements in (8b) and (9b) paraphrase in each case the presupposition Abusch's proposal predicts and we can verify easily that these predictions are correct.

- (8) a. Jan stopped smoking at three.
 b. Jan stopped smoking at three or he continued smoking at three. \leftrightarrow Jan was smoking until three.
- (9) a. Jan won.
 b. Jan won or Jan lost. \leftrightarrow Jan participated.

However, Abusch's proposal runs into problems with cases that contain more than one presupposition trigger. Consider the example in (10):

- (10) Jan stopped winning.

Example (10) clearly presupposes that Jan won in the past. For example, this entailment is preserved in the question (11a) and the negated version (11b).

- (11) a. Did Jan stop winning?
 b. Jan didn't stop winning.

Abusch's proposal, however, predicts that the presupposition of (10) to be the disjunction of the four alternatives in (12). These alternative are formed by replacing either one or both presupposition triggers in (10) with one of their lexical alternatives.

- (12) a. Jan stopped winning.
 b. Jan continued winning.
 c. Jan stopped losing.
 d. Jan continued losing.

The disjunction of the four sentences in (12) can be paraphrased as the presupposition that John participated in the past. This is evident if we spell out the lexical meanings of the presupposition triggers as in (13), where for simplicity I assume that winning means coming 1st and losing means coming last.

- (13) a. Jan came first in the past, but not this time.
 b. Jan came first in the past, and also this time.
 c. Jan came last in the past, but not this time.
 d. Jan came last in the past, and also this time.

The presupposition Abusch’s proposal predicts is therefore too weak because of the interaction of the two alternative sets. An overly weak prediction is also predicted by Abusch’s proposal in other examples containing two presupposition triggers. Consider abstractly the case of two presupposition triggers $p + q$ and $a + b$ occurring in a sentence S . Assume furthermore that the alternative to $p + q$ is $p + q'$ to predict presupposition p and the alternative of $a + b$ is $a + b'$ to predict presupposition a . Then, if two triggers occur in a single sentence, the predicted presupposition is the disjunction in (14).

$$(14) \quad S(p+q)(a+b) \vee S(p+q')(a+b) \vee S(p+q)(a+b') \vee S(p+q')(a+b')$$

Consider just the special case that S is additive in both argument positions.¹ Then the most problematic term is the last alternative, $S(p+q)(a+b')$, because this only has the entailment $S(p)(a)$ in common with the assertion – in (13), it is also the last term, (13d) that is most problematic. Hence, the predicted presupposition on Abusch’s proposal is $S(p)(a)$, rather than $S(p+q)(a) \wedge S(p)(a+b)$ as predicted by the standard theory of presuppositions.

But of course, there are ways to repair the proposal. Specifically, Abusch (p.c.) suggests assuming that the presuppositions from the alternative set are computed whenever one presuppositional item is encountered. This would ensure that never more than one presupposition trigger is considered in the same alternative sets, and would therefore avoid the problem just mentioned. The discussion here illustrates, however, that it is not easy to predict presuppositions while only making use of standard semantic and pragmatic notions such as the alternative set in the way familiar from question and focus semantics.

2 Implicated Presuppositions

The idea of an implicated presupposition is that it is derived exactly like an implicature, but in the presuppositional domain. The relevant type of implicature for the following is scalar implicatures (Horn, 1972). Examples of scalar implicatures are (15) and (16), where the implicature is indicated in (15b) and (16b).

- (15) a. The Philharmonic played some of Beethoven’s symphonies.
 b. They didn’t play all nine.
- (16) a. I saw Tom or Jim at the airport.
 b. I didn’t see both Tom and Jim at the airport.

¹ I.e. $S(p+q)(a+b) = S(p)(a) \wedge S(p)(b) \wedge S(q)(a) \wedge S(q)(b)$ for all p, q, a, b .

For the following, I assume that scalar implicatures are derived from the first maxim of quantity (Grice, 1975), and that the conditions on alternative sets are as proposed by Horn (1972, 1989). Specifically, I assume the alternative sets in (17). The scalar alternatives determine which assertions compete:

- (17) a. {some, all}
 b. {or, and}

To derive the scalar implicatures in (15) and (16), I assume that the Gricean maxims obligate a speaker to select the most informative assertion of those containing a scalar item, or one of its alternative that the speaker believes to be true. This corollary can be summarized as (18):

- (18) Make your contribution the most informative one of those you believe to be true.

This account predicts that the speaker uttering (15a) and (16a) does not believe the more informative alternatives with *all* and *and*. This is still weaker than the implicatures stated above, which say that the speaker believe that the stronger alternatives are false. However, I ignore this issue here (see Sauerland (2004b)) since it will not be relevant.

Heim's proposal for her account of the presupposition of *a* is based on an earlier proposal by Hawkins (1981). Hawkins assumes that *the* and *a* form an alternative set just like the two pairs in (17), and therefore predicts a scalar implicature of *a*.

- (19) {the, a}

Since Hawkins assumes the non-presuppositional, Russellian semantics of the definite determiner, the scalar implicature predicted for indefinite *a* is that there be more than one. Hence, Hawkins's proposal correctly predicts examples like (20) to entail that the victim have more than one father.

- (20) A father of the victim arrived at the scene.

Heim's contribution is to transfer Hawkins's account to the domain of presuppositions. This becomes necessary if we assume a presuppositional lexical entry for *the* rather than the Russellian one. Namely, if the definite presupposes existence and uniqueness, use of *the* and *a* are equally informative in any situation where both can be used, and therefore the condition in (18) does not predict the oddness of (20). Therefore Heim suggests the new pragmatic maxim in (21).

- (21) Make your contribution presuppose as much as possible! (Heim, 1991)

Heim's proposal predicts (20) to be odd as a consequence of (21): Since the speaker does not presuppose that the victim has a unique father, the speaker must either assume that the victim does not have a unique father or the speaker must be violating (21). In this way, use of the indefinite article generally leads to a presupposition which is complementary to that of the definite article—a presupposition that there not be a unique individual x satisfying the restrictor.

Heim discusses only the indefinite article as an application of maxim (21). Because of that and because the original publication was in German, Heim's proposal has not received much attention. In the remainder of this section, I show that there are numerous other cases where (21) does some work. Two cases already discussed in prior work are the non-factivity entailment of *believe* and the non-plurality entailment of the plural. The non-factivity of *believe* explains why (22a) is found to be slightly misleading if it was known to the speaker that 313 actually is a prime number. Generally the use of *believe p* suggests that p is at least not certain.

(22) John believes that 313 is prime.

While the non-factivity of *believe* has sometimes been called an implicature, it really belongs to the implicated presuppositions, if we explain by reference to the factive presupposition of *know*. For this natural explanation, a sentence containing *know* would be compared with the *believe*-version for the satisfaction of condition (21). Since the version with *believe* satisfies (21) only if the factive presupposition of *know* is not satisfied, the analysis predicts that the use of *believe* is only possible if the truth of its complement is not yet part of the common ground. In this way, we derive for *believe p* the implicated presupposition that the truth of p is not a common ground.

A second case of an implicated presupposition is the non-singularity entailment of the plural which was recently discussed in Sauerland et al. (2005); Spector (2007). In short, these works argue there that a plural number does not exclude singular reference by means of a lexical presupposition. However, a singular does have lexical presupposition of singularity. Therefore, an implicated presupposition is generated that the referent of a plural noun phrase be not known to be singular. This entails for example (23) that, if the number of Tom's children is known, it must be greater than one. If the number is not known, however, Tom having just one child is not ruled out. (cf. Hoeksema 1983)

(23) Tom's children must be well-behaved.

The epistemic property of implicated presuppositions illustrated by (23) generalizes to other implicated presuppositions. However, there are further characteristic properties of implicated presuppositions that can be used to distinguish implicated presuppositions from implicatures on the one hand and conventional presuppositions on the other. In the following subsection, I summarize such properties and provide their theoretical explanation.

2.1 Characteristics of Implicated Presuppositions

Implicated presuppositions are different from conventional presuppositions on the one hand, and implicatures on the other. One property already noticed in the previous section for the non-singularity of the plural is its epistemic status. This property is attested for the non-factivity of *believe*, as (24) illustrates. The speaker of (24) need not assume that it is part of the common ground that Mary is faithful to John, but rather (24) is also felicitous in a situation where it is unknown whether Mary actually is cheating on John or not. (24), however, similar to (22), would be odd in a context where it is already established that Mary is cheating on John.

(24) John believes that Mary is cheating on him.

The epistemic status of implicated presuppositions follows directly from maxim (21), as Heim already observes in the following way. An implicated presupposition results from the existence of a pair of two sentences *S* and *S'*, of which *S* has a presupposition *p* that *S'* lacks. Under circumstances where maxim (21) applies, it follows that *S'* can only be used when the speaker knows that *p* is not satisfied. Specifically, if the speaker does not know whether *p* holds, it follows that *p* is not satisfied. Therefore the implicated presupposition of *S'* is that *p* is not certain.

One of the examples Heim uses to illustrate the epistemic status of the non-uniqueness implicature of the indefinite is (25), which does not say anything about the availability of other 20 ft. long catfish in the area.

(25) Robert caught a 20 ft. long catfish. (Heim, 1991, (121))

The weak epistemic status of implicated presuppositions is only a necessary criterion for being an implicated presupposition, but not a sufficient one: It is conceivable that conventional presuppositions also presuppose that something is not certain, though I do not know of any such examples. Epistemic status, however, is useful for deciding for a pair of lexical items with contradictory implicatures which one has a conventional presupposition. Furthermore, epistemic status distinguishes implicated presuppositions from implicatures, which generally have a stronger epistemic status (see Sauerland 2004b; Fox 2007 for recent discussion). For example, (26a) is understood to implicate not just that the Philharmonic is not certain to have played all of Beethoven's symphonies, but rather that they certainly did not play all of them.

(26) The Philharmonic played some of Beethoven's symphonies.

For this reason, scalar implicatures do not follow from Gricean maxims only, but require an additional or an entirely different mechanism. It is instructive that this mechanism does not apply to implicated presuppositions in the same way,

as attested by the difference in epistemic status between scalar implicatures and implicated presuppositions.

A second contrast between implicatures and implicated presuppositions is their projection through negation. Implicated presuppositions, just like conventional presuppositions, are not affected by negation unchanged. This is illustrated for all three implicated presuppositions discussed up to now in (27).

- (27) a. John doesn't believe that 313 is prime.
 b. I haven't met Tom's children.
 c. Robert didn't see a father of the victim.

The projection behavior of implicated presuppositions follows in the following way: The conventional presuppositions of the relevant alternative sentence project in the way known for conventional implicatures. So, for example, the alternative of (27a) with *know* projects a factivity presupposition to the sentence level. Therefore conventional presupposition of the alternative sentence is exactly the same as that of the unnegated sentence. But then, it follows that the implicated presupposition, which is derived from the conventional presupposition of the alternative is also the same as the implicated presupposition of the unnegated sentence. In this way, it follows more generally that all implicated presuppositions project through expressions that project conventional presuppositions unchanged.

Implicated presuppositions clearly contrast with scalar implicatures in this way. Scalar implicatures are reversed in the scope of negation and other downward-entailing operators (Atlas and Levinson, 1981; Sauerland, 2004b): The positive sentence with *some* implicates the negation of the sentence with *all*, as seen above, and the positive sentence with *all* has no scalar implicature. In contrast, the negative sentence (28) with *all* implicates its negation when *all* is replaced by *some*: Since the double negation then cancels each other out, this predicts the implicature that the Philharmonic played some of Beethoven's symphonies.

- (28) The Philharmonic didn't play all of Beethoven's symphonies.

The negative sentence with an indefinite, on the other hand, has no scalar implicature.

- (29) The Philharmonic didn't play one Beethoven symphony/Beethoven symphonies.

While in the case of negation, implicated and conventional presuppositions projected in the same way, this is not the case for projection over a universal quantifier. Conventional presuppositions, as illustrated by the examples in (30), project universally across a universal (Heim, 1983): (30a) presupposes that every audience member's support really was crucial for the team, and (30b) presupposes that every student has exactly one sister.

- (30) a. Every audience member knows that his support was crucial for the team.
 b. Every male student looks similar to his sister.

This is supported by the fact that it is odd to continue (30a) with *But, John's support really wasn't crucial* or (30b) with *And therefore, John looks similar to both of his*. So the universally projected presupposition is not easily contradicted.

Universal projection does not obtain with implicated presuppositions as the examples in (31) show: (31a) could be continued felicitously with *but only John's support really was*, and (31b) with *And therefore, John should invite his sister*.

- (31) a. Every audience member believes that his support was crucial for the team.
 b. Every student should invite his sisters.

The example in (32) shows that the non-uniqueness presupposition of the indefinite also does not project universally. Here, I imagine a scenario where several candidates applied. Some have written only one book, others have written more than one, and the selection committee knows exactly who has written how many. Then the committee could decide (32b) while (32a) would be odd. (32a) would only be acceptable if every candidate was known to have written exactly one book or one book of each candidate was salient. (32b) on the other hand is compatible where some of the candidates have actually written a unique book, corroborating my claim that the relevant presupposition of (32b) could be paraphrased as: Not every candidate has a unique book.

- (32) a. #Every candidate should send his book.
 b. Every candidate should send a book of his.

The difference in projection across universals between conventional and implicated presuppositions follows again straightforwardly from the proposed analysis: Conventional presuppositions project universally as $\forall xP(x)$, where P be the presupposition. Hence, the corresponding implicated presuppositions have the logical structure $\neg\forall x: P(x)$, or equivalently $\exists x: \neg P(x)$ – this follows in the same way as the weak epistemic status of implicated presuppositions.

In the interaction with universals, implicated presuppositions therefore behave much like scalar implicatures. There might, however, be a small difference. It has been claimed sometimes, for instance by Chierchia (2004), that a scalar term in the scope of a universal gives rise to a stronger implicature than the strength observed above. For example, Chierchia claims that (33a) has implicature (33b) rather than (33c).

- (33) a. Every student wrote a paper or did a presentation.
 b. strong implicature: No student did both.

- c. weak implicature: Not every student did both.

However, I still remain skeptical about this point as examples can easily be constructed where the stronger implicature does not obtain. Consider (34a), which to my mind clearly does not implicate (34b), but rather (34c). In this case, therefore, implicatures behave exactly like implicated presuppositions.

- (34) a. All of Bill's relatives drink or smoke.
 b. strong implicature: None of them does both.
 c. weak implicature: Not every one of them does both.

In sum, the following three characteristics set implicated presuppositions apart from scalar implicatures, on the one hand, and conventional presuppositions on the other: They must have weak epistemic status in contrast to scalar implicatures and conventional presuppositions, where the weak epistemic status does not seem to be necessary. They project through negation which scalar implicatures do not. And they do not project universally through a universal quantifier unlike conventional presuppositions. Finally, I should note that I will return to the issue of how implicated presuppositions project in Section 3; while I considered in this section the projection across negation and universals, there I consider projection across presupposition filters.

2.2 Further Evidence

Five other cases of implicated presuppositions are the non-uniqueness and non-duality of universal quantifiers, the non-imperative presupposition of the French subjunctive, the non-past presupposition of the present tense, and the various presuppositions of nominal and pronominal agreement features.²

Consider first the case of the English universal quantifier *every*. English universals have both a non-uniqueness and a non-duality presupposition³, which explain why the two sentences in (35) are odd.

- (35) a. #Every nose of Kai's is runny.
 b. #Every cheek of Lina's is rosy.

The non-uniqueness and non-duality presuppositions follow from Heim's maxim (21) since the sentences in (36) presuppose more: (36a) presupposes that Kai has a unique nose, and (36b) presupposes that Lina has two cheeks.

² Amsili and Beyssade (2006) discusses an interesting sixth case: the *distinctness* constraint on subject reference in coordinated sentences like (ia), which do not contain any explicit marker of parallelism (cf. (ib) which contains *too*). This case is particularly interesting because the implicated presupposition applies in a sentence not containing any trigger.

- (i) a. *? John is sick and Mary is sick.
 b. John is sick and Mary is sick, too.

³ Kazuko Yatsushiro (p.c.) has reminded me of the latter, also noting that it is weaker than the non-uniqueness presupposition.

- (36) a. The nose of Kai's is runny.
 b. Both cheeks of Lina's are rosy.

Further evidence for the status of non-uniqueness and non-duality as implicated presuppositions can be obtained from the three criteria developed in the previous section. The weak epistemic status is evident when we consider example (37), which does not presuppose that I will have more than two students in my next class, but merely that such a bigger number is possible.⁴

- (37) Every student in my next class will have to work hard.

Projection across negation of the non-uniqueness and non-duality presuppositions is clearly shown by the two examples in (38).

- (38) a. #His father didn't wipe every nose of Kai's.
 b. #Her father didn't cream up every cheek of Lina's.

Finally, example (39) shows that neither the non-uniqueness nor the non-duality presupposition project universally when in the scope of another universal. Consider here a scenario that is a slight variant of the one for example (32): Several candidates applied. Some have written only one paper, others two, and the rest have written more than two. In this scenario neither non-uniqueness nor non-duality is satisfied for every candidate, but (39) is nevertheless acceptable.

- (39) Every candidate should send every paper of his.

The French subjunctive is discussed in detail by Schlenker (2005). He argues that it is the semantically unmarked form in French verbal morphology. One specific point, he argues, is that it has an implicated presupposition of non-imperativity. This provides an explanation for the facts in (40) and (41). In the second person singular (40a), the subjunctive cannot be used with an imperative interpretation, and also no other interpretation is available for (40a), which is therefore odd. This, Schlenker explains by reference to the imperative form in (40b).

- (40) a. #Que tu sois prudent!
 That you be-SUBJ cautious

⁴ Interesting to consider here are examples where numerosity one or two is presupposed, but it is uncertain whether the actual numerosity is one or two. The prediction of Heim's analysis is that *every* should be possible in this case, if singular *the* and *both* both presuppose exactly the numerosity one or two respectively. The cases in (i), in my judgement, corroborate this prediction:

- (i) a. Eagles lay one or two eggs each summer. The researcher has permission to study every egg of this eagle this summer.
 b. John will either look at one or both sides of the sheet. Every side he looks at, he will initial.

- b. Sois prudent!
Be-IMP cautious

Direct evidence for this proposal comes from example (41), which shows that the subjunctive is compatible with an imperative interpretation in general. Specifically, the generalization Schlenker draws is that the subjunctive can have an imperative interpretation if and only if the imperative form of the same person class is morpho-syntactically blocked.

- (41) Que votre Altesse soit prudente!
That your Highness be-Msubj cautious!

In this case the argument for an implicated presupposition is of a different type than those sketched above for indefiniteness and other categories. Namely, in this case the argument is based on the fact that, when the form with stronger presuppositions is blocked for independent reasons (in the case of (41) this is presumably for morpho-syntactic reasons), the weaker form must be used even in examples like (41). In this way, the semantically unmarked form emerges under blocking.

Two other cases of implicated presuppositions, I have discussed in other places in some detail: tense (Sauerland, 2002) and ϕ -features (Sauerland et al., 2005; Sauerland, 2006). Concerning tense, I argue that the English present tense should be viewed as semantically vacuous, but as giving rise to a non-pastness presupposition. That non-pastness is an implicated presupposition I show, for example, by means of the contrast in (42): (42a) must talk about only past Tuesdays, but (42b) would usually talk about present and non-present Tuesdays. This is exactly the difference between universal projection of the conventional past presupposition in (42a) and non-universal projection of the implicated non-past presupposition in (42b).

- (42) a. Every Tuesday, I fasted.
b. Every Tuesday, I fast.

Concerning ϕ features, I argue that person, number and gender features all have semantically vacuous unmarked values. For person, the unmarked value is third person (cf. Benveniste 2006), for number it is plural (Sauerland et al., 2005) and for gender it differs among languages (Sauerland, 2006). In this case, too, my argument is based on the non-universality of projection and the epistemic status of the presupposition, as well as from blocking as in the French subjunctive (41) above.

3 Implementation

The previous section has provided evidence for the existence of a class of implicated presuppositions separate from scalar implicatures and presuppositions. In

this section, I focus on the mechanisms that derive these implicated presuppositions. I first show that what initially seems to me to be the most straightforward implementation faces problems with presupposition filters, as Percus (2006) discovered. I then go on to present a different solution to this problem from Percus's solution where I make use of Schlenker's (2007) approach to presupposition and projection.

Heim (1991) proposes maxim (21) with an explicit note that her proposal is to be only taken to indicate a direction for future research. A full proposal needs to say more specifically from what set of alternatives the one with maximal presuppositions must be selected. Here the examples in the previous section provided some information. For example, we assumed that a sentence with *a* has the sentence with *the* instead of *a* as an alternative to derive the non-uniqueness implicature of *a*. Evidently though, it is not any other sentence or even every partial proposition is an alternative to a sentence *S*: So, while (43c) is an alternative for (43a), it cannot be an alternative for (43b) since the use of (43c) is felicitous in the context of (43), even though the presupposition of (43b) asymmetrically entails (43c).

- (43) The victim's father arrived wearing pyjamas.
- a. #A father of the victim identified his son.
 - b. The father of the victim who was wearing pyjamas identified his son.
 - c. The father of the victim identified his son.

Another observation regarding the non-uniqueness implicated presupposition of the indefinite is that, in cases like (44a) the most direct alternative (44b) is hardly grammatical in English. Instead the more compact (44c) is preferred. At this point, the theory could either say that ungrammatical alternatives are sometimes considered or could allow (44c) as an alternative. While I follow the former line below, I know of no good evidence bearing on this choice.

- (44) a. #A father of John's arrived.
 b. *?The father of John's arrived.
 c. John's father arrived.

More informative even is the case of *every*: To derive the non-uniqueness and non-duality presuppositions of *every* we have to assume that it has as alternatives *the* and *both*. This shows that the alternatives need not be identical. Since *both* combines with the plural, while *every* combines with the singular, we furthermore assume that both singular and plural variants of the NP can occur in the set of alternatives relevant for presupposition maximization. This in itself is not surprising, since I also referred to arguments that the plural and singular generally are alternatives to each, but the example tells us something else: Standardly, it is assumed that semantically contentful number marking does not occur on

the determiner itself, but in some other position of the DP (see Heycock and Zamparelli 2005; Sauerland 2003 for recent proposals). Therefore the interaction of alternatives with a different determiner and different number shows that alternatives cannot be defined solely as one morpheme change.

At this point there are still many ways to understand the set of underlying alternatives. From my perspective, a straightforward mechanism would be an extension of the mechanism I proposed for scalar implicatures (Sauerland, 2004b). There I argued for a view of scalar implicatures as derived from alternative sentences based on sets of lexical sets. The ones relevant for this paper are shown in (45):

- (45) *Scales*: {the, every, a, both}, {believe, know}, {SING, PLUR},
 {SPEAKER, HEARER}, {PRESENT, PAST}, ...

Using these sets of lexical alternatives, I define a set of alternative sentences as in (46):

- (46) $\text{Alt}(S) = \{S' \mid \text{the only differences between } S \text{ and } S' \text{ are replacements of one member of one of the sets in (46) with another element of the same set}\}$

Now the maxim (21) could be spelled out as in (47). In order to block S , and thereby lead to an implicated presupposition, an alternative must satisfy three conditions: its presuppositions must be satisfied, as (47a) states; it must be true according to the speaker, as (47b) states; and it must have more informative presuppositions than S , as (47c) states.

- (47) *Maximize Presupposition* (preliminary version): Do not use S in context set c if there is an S' such that:
- a. $c \subset \text{domain}(\llbracket S' \rrbracket')$
 - b. you believe S' to be true
 - c. $\text{domain}(\llbracket S' \rrbracket) \subset \text{domain}(\llbracket S \rrbracket)$

While this proposal seems straightforward, Percus (2006) shows that the proposal has a problem with presupposition filters.⁵ The contrast Percus (2006) discusses is (48). This contrast is not explained by the principle in (47) because (48a) and (48b) have the same presuppositions. Specifically, *both* does not contribute to the global presupposition of (48a) because a universal with restrictor R and scope S projects only the presupposition $\forall x R(x) \rightarrow S(x)$ (Heim, 1983). For (48a), this only amounts to the tautology that everyone who has exactly two students has exactly two students, and therefore (48a) is defined for exactly the same possible worlds that (48b) is defined for.

⁵ In the classification of presupposition projection properties of words by Karttunen and Peters (1979), *holes* are recognized as a category of presupposition absorbing operators. However, I do not believe that this category actually has any members (cf. Heim 1992). If there were any, they would give rise to the same problems as filters do.

- (48) (Percus, 2006, (30))
- a. Everyone with exactly two students assigned the same exercise to both of his students.
 - b. #Everyone with exactly two students assigned the same exercise to all of his students.

However, the contrast in (48) is one that we would expect the right account of implicated presuppositions to predict, since it is a contrast between *both* and *all*. Therefore, Percus correctly argues that the proposal in (47) is not satisfactory as an account of implicated presuppositions.

The same point can be made with other presupposition filters and other implicated presuppositions as the examples in (49) and (50) show. In (49b), the filter is a conditional clause and the trigger of the implicated presupposition is *believe*. In (50b), the filter is a conjunction and the trigger is an indefinite. In both cases, proposal (47) predicts no implicated presupposition because the alternatives in (49a) and (50a) do not possess a stronger presupposition since the presuppositions introduced by the lexical alternatives of *believe* and the indefinite respectively are filtered out.

- (49) a. If it was raining, John would know that it's raining.
 b. #If it was raining, John would believe that it's raining
- (50) a. He has only one daughter and his daughter is very young.
 b. #He has only one daughter and a daughter of his is very young.

Percus's discovery shows that proposal (47) conceives the comparison mechanism underlying implicated presuppositions wrongly. That proposal (47) compares only the presuppositions of two complete sentences makes it too global to capture the effect in examples (48) through (50).

Percus adopts a proposal he attributes to Schlenker (2005) that conceives of the comparison mechanism as applying purely locally: at the level of a lexical item. Percus introduces the notion of a lexical item being *presuppositionally stronger* than another. This notion derives ordered lexical scales rather than the unordered sets of lexical alternatives above. For the presupposition triggering items relevant in this paper, the lexical scales Percus would derive in this way are the ones in (51), where the presuppositionally stronger item is always shown on the left.

- (51) Scales: ⟨the, a⟩, ⟨both, every⟩, ⟨the, every⟩, ⟨both, all⟩, ⟨the, all⟩, ⟨know, believe⟩, ⟨SING, PLUR⟩, ⟨+SPEAKER, -SPEAKER⟩, ⟨+HEARER, -HEARER⟩, ⟨PAST, PRESENT⟩, . . .

Using these lexical scales, Percus formulates the Maximize Presupposition Principle in a completely local manner in (52). The only difference is the comparison clause (52c), which now defines the comparison as purely local.

- (52) *Maximize Presupposition* (à la Percus 2006): Do not use of S in context set c if there is an S' such that:
- a. $c \subset \text{domain}(\llbracket S' \rrbracket')$
 - b. you believe S' to be true
 - c. S' is derived from S by a single or multiple replacements of one item of a scale with another item higher on the same scale

While this proposal achieves better empirical coverage, it does so at the cost of sacrificing the analogy between scalar implicatures and implicated presuppositions. The Schlenker-Percus proposal closely resembles the proposal by Horn (1972) and Gazdar (1979) for scalar implicatures. They propose that lexical scales are ordered and that scalar implicatures are essentially derived by replacing one scalar item with the next stronger item on the same scale and negating the result. Following Atlas and Levinson (1981), I have criticized this kind of proposal on the basis of the interaction of scalar implicatures with negation (Sauerland, 2004b). Consider the examples in (53). When the scalar item *many* occurs in a positive sentence, the scalar implicature predicted by replacing *many* with *all* is correct, giving rise to the implicature that Tina didn't know all of the people there. With *many* in the scope of negation as in (53b), however, the same algorithm would predict wrongly the implicature that Tina knew all of the people there. The intuitively correct implicature, that Tina knew a couple of people there, results in this case by replacing *many* with the next weaker item on its scale, *a couple*, and then negating the result.

- (53) a. Tina knew many of the people there (but not all).
 b. Tina didn't know many of the people there (but only a couple).

This shows that for scalar implicatures the comparison should not be completely local in the way it is in (52). This would be an interesting difference between scalar implicatures and implicated presuppositions; one, that ought to be investigated more closely to see whether it is real and what it stems from. However, as long as presuppositions and assertions are two separate properties of lexical items, the difference between presuppositions and implicatures can be stated as above. Percus's explanation of his observation would therefore support the lexical separation of presupposition and assertion and argue against recent proposals that argue against this separation such as Schlenker (2007). I return to this matter below, but first note an empirical problem with (52).

Since presuppositions project unless they are filtered, it is difficult to make an empirical case against the Schlenker-Percus proposal along the lines of the cases in (53). One small empirical problem, however, arises with the derivation of the non-duality implicature of *every* illustrated by (54a), which is repeated here from (35). As noted above, the natural alternative to derive non-duality from is (54b). But, (54b) is derived from (54a) by two changes: replacement of *every* with *both* and replacement of the feature SING with the feature PLUR. Only the former

of the two goes in the direction from a lower to a higher item on the presuppositionality scale. The replacement of SING with PLUR, however, goes in the opposite direction: the presupposition-less PLUR is replaced with the presuppositionally stronger SING. Therefore, this is unexpected from the perspective of the Schlenker-Percus maxim (52).

- (54) a. #Every cheek of Lina's is rosy.
 b. Both cheeks of Lina's are rosy.

While this problem may be solvable, consider now the difference between implicated presuppositions and scalar implicatures within the recent proposal of Schlenker (2007), that aims to remove the lexical difference between presupposition and assertion. Schlenker assumes a strictly bivalent logic and therefore no semantic distinction between presupposition and assertion. The account of presuppositions he proposes is entirely pragmatic and has two parts: *Division* and *Be Articulate*. *Division* derives that the meanings of some lexical items have two parts, one of which is called the pre-condition. For example, Schlenker assumes that the lexical meaning of *know* is $\lambda p \lambda x. p \wedge \text{believe}(x, p)$. *Division* derives that the meaning of *know* is conceived of having two parts corresponding to the two parts: the precondition $\lambda p \lambda x. p$ and the second part $\lambda p \lambda x. \text{believe}(x, p)$. Schlenker distinguishes the precondition by underlining such that *know* can be written as $\underline{p}q$. By convention, \underline{p} stands for a lexical item that has the same interpretation as the precondition \underline{p} . A second convention is that the notation $\underline{p}q$ is taken to entail that the presupposition is non-trivial. Schlenker does not, at this point, provide a full theory of how *division* takes place and I will also leave it at that.

Division feeds into the principle *Be Articulate* as formulated in (55). The intuition behind this principle is that a speaker must not say too many things at the same time: generally instead of the divisible $\underline{p}q$ it is preferable to say \underline{p} and \underline{q} .

- (55) *Be Articulate!* (cf. Schlenker 2007, (2)) If \underline{p} and $(\underline{p})q$ can be uttered felicitously in a syntactic context $\alpha _ \beta$, $\alpha [\underline{p}$ and $(\underline{p})q] \beta$ is preferable to $\alpha \underline{p}q \beta$.

Consider (56a) as an application of (55). (55) states that (56b) must be used instead of (56a) unless (56b) cannot be uttered felicitously. One major class of cases where (56b) cannot be used felicitously are those where the first conjunct—that Mary is cheating on John—is already part of the common ground. This derives that (56a) can be used when the presupposition—now in a non-technical sense—that Mary is cheating on John is part of the common ground. A difference between Schlenker's account and standard presupposition theory is that it so far does not necessarily derive that (56a) can only be used when the presupposition is satisfied: if there are other circumstances in which (56b) is not felicitous, (56a) might be useable under those circumstances (a prediction Schlenker 2006

endorses). In the following, I only consider the case of the more articulate (56b) being infelicitous because of the redundancy of the first conjunct.

- (56) a. John knows that Mary is cheating on him.
b. Mary is cheating on John and John knows it.

As Schlenker formulates *Be Articulate!* in (55), he leaves it open whether (56a) is compared with (56b) or (57). In (57), in contrast to (56b), the factive precondition is not expressed in the second conjunct. However, (57) is pragmatically odd. In fact, (57) is analogous to Percus's example showing the interaction between presupposition filters and implicated presuppositions above.

- (57) #Mary is cheating on John and John believes it.

However, since Schlenker does not assume a lexical distinction between presupposition and assertion, implicated presuppositions are predicted by his proposal as normal scalar implicatures assuming appropriate scales. For example, if *believe* and *know* form a scale, (58a) implicates that the sentence (58a) with *know* instead of *believe* should be false. A complication at this point is that the sentence with *know*, if asserted, would need to satisfy *Be Articulate* and, since Schlenker shows that his proposal predicts standard assumptions about presupposition projection, the sentence with *know* could only be asserted when it is part of the common ground that Mary is cheating on John. But, then the negated alternative with *know* would contradict the asserted positive sentence with *believe*. But, if we assume that *Be Articulate* does not apply internally, (58b) is predicted as an implicature of (58a).

- (58) a. John believes that Mary is cheating on him.
b. It is not certain that Mary is cheating on John.

This will be generally the case when we consider q when there is an alternative pq and they are not embedded below another logical operator.

In the case of (57), however, the conflict between the assertion and the implicature is unresolvable. The implicature derived from (57) by replacing *believe* with *know*, and negating the result is (59). But, (59) and (57) are equivalent. Because of this conflict between assertion and implicature, (57) is predicted to be odd.⁶

- (59) It is not the case that Mary is cheating on John and he knows it.

⁶ Cancellability of implicatures might seem to be a problem for this analysis. But, the logical contradiction arises already from the epistemically weaker implicature that it is not certain that Mary is cheating on John and he knows it, and it has been observed that such epistemically weak implicatures (*primary implicatures* in the terminology of (Sauerland, 2004b)) are very hard if not impossible to cancel (Sauerland 2004a and references there).

However, I argued in section 2.1 that implicated presuppositions differ from scalar implicatures in two areas: the projection from below negation and the weak epistemic status. I here consider just the former. Look at example (60a), which has the implicated presupposition that it is not part of the common ground that Mary is cheating on John.⁷ In this case, however, the implicature predicted is the negation of (60a) with *know* instead of *believe*. Since the double negation cancels out, and the part of *know* that entails belief contradicts the assertion, the predicted implicature is (60b)—exactly the opposite of the desired result.

- (60) a. John doesn't believe that Mary is cheating on him.
 b. It is certain that Mary is cheating on him.

Unless this result can be traced back to the theory of implicatures I have assumed, (60a) is a clear problem for the account investigated here. At this point, it seems necessary to postulate a new maxim, (61), to account for implicated presuppositions within Schlenker's.

- (61) *Maximize Redundancy* If pq and q can uttered felicitously in a syntactic context $\alpha_ \beta$, $\alpha \underline{pq} \beta$ is preferable to $\alpha q \beta$

3.1 Conclusion

In sum, I have shown in this paper that there is a distinct category of implicated presuppositions that is separate from scalar implicatures and conventional presuppositions. In the last section, I have considered various theoretical proposals to account for implicated presuppositions. I have shown that ultimately a separate principle (61) may be necessary to account for implicated presuppositions.

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⁷ This is corroborated by the oddness of (ia) compared to (ib):

- (i) a. #Mary is cheating on John, but he doesn't believe it.
 b. Mary is cheating on John, but he doesn't know it.

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