Solving Learnability Problems in the Acquisition of Semantics

ANDREA GUALMINI AND BERNHARD SCHWARZ
Utrecht University Bernhard & McGill University

Abstract
This paper proposes solutions to two semantic learnability problems that have featured prominently in the literature on language acquisition. Both problems have often been deemed unsolvable for language learners as a matter of logic, and they have accordingly been taken to motivate principles making sure they will not actually arise in the course of language acquisition. One problem concerns the acquisition of ambiguous sentences whose readings are related by entailment. Crain et al.’s (1994) Semantic Subset Principle is intended to preempt the problem by preventing acquisition of the weaker reading before the stronger reading has been acquired. In contrast, we demonstrate that this very order of acquisition becomes feasible in principle if children can exploit non-truth-conditional evidence of various kinds or evidence from sentences containing downward entailing operators. The other learnability problem concerns the potential need for expunction of certain readings of ambiguous sentences from a child’s grammar. It has often been assumed that, in the absence of negative evidence, such expunction is impossible, and Wexler and Manzini (1987) posit a Subset Principle to preempt the problematic learning scenario. We argue, however, that if the evidence available to the child includes dialogues, and if listeners are expected to interpret speakers’ utterances charitably, then expunction of unavailable readings is possible in principle.

1. TWO SEMANTIC LEARNABILITY PROBLEMS
Research in the acquisition of semantics has identified two learnability problems that children must either avoid or solve in order to attain full semantic competence. One problem, identified by Wexler and Manzini (1987) and Crain and Thornton (1998), among others, derives from the well-motivated assumption that children do not have access to negative evidence (see Brown & Hanlon 1970; Marcus 1993). According to this assumption, children are not consistently corrected for linguistic errors and would therefore not receive direct evidence that a sentence they utter is ungrammatical or that a particular semantic interpretation they can assign is unavailable. To illustrate the semantic learnability problem posed by the absence of negative evidence, consider the case of reflexive
pronouns, discussed in Wexler and Manzini (1987). Simplifying somewhat, the grammar of English requires that a reflexive have an antecedent in the smallest clause containing the reflexive. In this, English differs from Icelandic, for example, where a reflexive can be separated from its antecedent by a non-finite clause boundary. Suppose now a child exposed to English incorrectly hypothesizes that the reflexive himself has the grammar of Icelandic reflexives. Such a child would incorrectly consider an English sentence like (1) grammatical, as he would allow for John to antecede himself.

(1) John told me to shave himself

Moreover, the child would incorrectly allow for two interpretations of sentences like (2), licensing the unavailable non-local reading (3b) in addition to the available local reading (3a).

(2) John told Bill to shave himself
(3) a. John told Bill to shave Bill (local)
   b. John told Bill to shave John (non-local)

The question that arises in this hypothetical situation is how a child exposed to English might manage to expunge the non-local interpretation from his grammar. To be sure, children learning English have ample exposure to adult utterances supporting the existence of local readings, and very little or no evidence for the existence of non-local readings. Lack of evidence for a certain reading is not the same as direct evidence against it, however, and assuming no such negative evidence exists, it is not clear how the child could unlearn an initially hypothesized non-local interpretation. We will refer to this semantic learnability problem as the expunction problem.

Another semantic learnability problem, first identified in Crain et al. (1994), concerns the acquisition of certain ambiguities. These authors propose that generally, a child who at some stage has acquired one reading of a sentence could add a second reading on the basis of truth-conditional evidence, that is, through exposure to an utterance of the sentence as a description of a situation where only the second reading is true. This seems like an easy step, as long as the child assumes that the speaker is cooperative in the sense of Grice (1975) and in particular

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1 We will elaborate on this point in the concluding section of the paper. For the time being, the relevant point is that, on the assumption that direct negative evidence is not available, acquiring that a given string is unacceptable (or a given meaning is unavailable) and acquiring that a certain string is acceptable (or a certain meaning available) differ in important respects. In particular, the former task seems to require that the acquisition process exploits both the input that the learner experiences and the absence of input that he could have experienced, but did not.
obeys the Maxim of Quality. A problem arises, however, in the case of so-called privative ambiguities, that is, ambiguous sentences where one reading truth-conditionally entails the other (Horn 1989). Let us call the reading that entails the other the strong reading, and the reading that is entailed the weak reading. Suppose that at some stage of language acquisition a child has learned the strong reading of the relevant sentence, but he has not yet acquired the weak reading. Again, such a child could find evidence for the existence of the weak reading by hearing the sentence as a description of a situation where only the weak reading is true. Crain et al. (1994) moreover argue that the availability of this type of evidence is made likely by what they call the Principle of Parsimony, a principle that leads adults to prefer weak readings of sentences with a privative ambiguity. If adult speakers indeed prefer to use the relevant sentences on exactly those readings that children need to acquire in the relevant learning scenario, that is, on their weak readings, then this will help ensure that children receive robust evidence for such readings.

But now imagine that a child has learned only the weak interpretation of a sentence. Since the strong reading entails the weak reading, there cannot be a situation in which only the strong reading of that sentence is true. So, it is unclear how the child’s linguistic experience might ever provide evidence for the availability of the strong reading.

This point is illustrated by Crain et al. (1994) with an example featuring the phenomenon that Jackendoff (1972) dubbed association with focus. Suppose sentence (4) below is pronounced with a pitch accent on the final noun house.

(4) The dinosaur is only painting a house

This pitch accent may indicate narrow focus on the object noun phrase a house or wide focus on the verb phrase painting a house. The resulting readings can be paraphrased unambiguously with the examples in (5), where the relevant foci feature as pivots of so-called pseudo-cleft sentences.

(5) a. A house is the only thing that the dinosaur is painting (narrow focus)
   b. Painting a house is the only thing that the dinosaur is doing (wide focus)

2 The evidence discussed by Crain et al. (1994) comes from adults’ comprehension of ambiguous sentences. Strictly speaking, in order to characterize the input available to children, a study on production would be more informative.
Let us now consider how a child could learn that (4) is ambiguous. A child who has acquired only the wide focus reading could be led to posit the narrow focus reading by experiencing an utterance of (4) in a situation where only the narrow focus reading is true. For instance, this could be achieved in a situation where the dinosaur is painting a house and nothing else, but is also eating a sandwich. In this kind of situation, the assumption that the speaker is cooperative would lead the child to infer that an interpretation other than (5b) must have been intended.

But let us now turn to an alternative scenario, one in which the child initially assumed that (4) only has the weak, narrow focus interpretation. Crain et al. (1994) argue that no evidence would allow the child to acquire the strong, wide focus reading. This is because the ambiguity under consideration is privative. The wide focus reading entails the narrow focus reading, as not doing anything (but painting a house) entails not painting anything (but a house). So the child can never experience an utterance of (4) in a situation where only the wide focus reading is true. It is therefore not clear how such a child would ever be led to posit the wide focus reading in addition to the narrow focus reading. We will refer to this second semantic learnability problem as the *entailment problem*.

The expunction problem and the entailment problem are potential problems facing the child in the course of language acquisition. However, they may not be problems that the child will actually need to solve. In fact, Manzini and Wexler (1987) and Crain and Thornton (1998) argue that the learnability problems in question would be unsolvable if language learners ever had to face them, and they accordingly suggest that the Language Acquisition Device is designed to ensure that the problems in question never arise in the first place. Manzini and Wexler (1987) posit the *Subset Principle*, a constraint on the Language Acquisition Device intended to ensure that children always select the smallest language compatible with the available evidence (see also Berwick 1985). In cases where the readings generated by the values of a parameter are in a subset–superset relation, this would lead the child to learn the readings of potentially ambiguous sentences conservatively, positing a reading made available by Universal Grammar only when his current grammar does not allow him to assign an interpretation that makes the relevant linguistic input true.

Although the Subset Principle would ensure that children never have to retract from a grammar that generates a superset of the structures or readings that are licensed by the target grammar, it does not address the entailment problem, the learnability problem that is
associated with privative ambiguities. To address this problem, Crain et al. (1994) propose that the Language Acquisition Device includes an additional principle, which prevents children from positing only a weak reading of a potentially ambiguous sentence. More specifically, since Crain et al. subscribe to the view that readings are learned conservatively so that children will not have to face the expunction problem, they propose that in cases where one reading entails the other, the Language Acquisition Device ensures that the strong reading is always hypothesized first. Crain et al. (1994) refer to this constraint as the Semantic Subset Principle.

According to the proposals discussed above, then, the expunction problem and the entailment problem are unsolvable and the principles preempting them have the flavour of conceptual necessities. In this paper, we will question the premise that the learnability problems under consideration are unsolvable, and hence we will question the motivation for the relevant preempting principles given in the literature.

In section 2 below, we will first show how children could solve three instances of the entailment problem on the basis of different kinds of information. We will also describe a more general solution to the entailment problem which exploits the semantics of so-called downward entailing operators. Crucially, we show that truth-conditional evidence can lead children to solve all the instances of the entailment problem that have been discussed in the literature. Turning to the expunction problem, in section 3 we will explain how a child might expunge unavailable readings on the basis of dialogues, dialogues that may or may not include the child as an active participant. Importantly, the kinds of dialogues we have in mind do not qualify as negative evidence in the usual sense. We are not suggesting that adults directly advise children of the unavailability of certain readings. However, we assume that adults may well object to utterances that they consider false, including utterances produced by children (see Brown & Hanlon 1970), and we explain how such factual objections may provide evidence to the child that a particular interpretation is not actually available.

2. SOLVING THE ENTAILMENT PROBLEM

In this section we will take a closer look at the entailment problem and propose a general possible solution that children might apply. To recapitulate, in cases of privative ambiguity, a child who has only learned the strong reading could find direct, purely truth-conditional,
evidence for the existence of the weak reading, namely by experiencing the sentence as a description of a situation where only the weak reading is true. The entailment problem is the observation that no analogous direct truth-conditional evidence would be available to a child who has only learned the weak reading, given that there are no possible situations where only the strong reading is true. As mentioned, Crain et al. (1994) suggest that the absence of such truth-conditional evidence makes it impossible for a child to learn a strong reading after first learning a weak reading, hence that the entailment problem is unsolvable. They accordingly posit the Semantic Subset Principle as a constraint that preempts the entailment problem.

We believe that the introduction of such a principle is insufficiently motivated. The claim that any instance of the entailment problem is unsolvable ignores a range of conceivable solutions that might be open to the child. Below we will first describe solutions to the entailment problem that apply in certain special cases that have been used to illustrate the entailment problem in the literature, and then move on to present a more general solution that applies in all cases, a solution that exploits children’s knowledge of the semantics of downward entailing expressions.

2.1 Solving special cases: non-truth-conditional evidence and scalar implicatures

Below we will discuss three specific cases of privative ambiguity which have been taken to motivate the Semantic Subset Principle in the literature. In each case, we will argue that particular features of the ambiguity in question could allow the child to solve the instance of the entailment problem at hand, and hence that the ambiguity in question does not in fact establish the need for the Semantic Subset Principle.

We start by considering one of the examples that Crain et al. (1994) have used to motivate the Semantic Subset Principle. Recall that sentence (4), repeated below, has the weak, narrow focus reading in (5a) as well as the strong, wide focus reading in (5b).

(4) The dinosaur is only painting a house

(5) a. A house is the only thing that the dinosaur is painting (narrow focus)
   b. Painting a house is the only thing that the dinosaur is doing (wide focus)

According to Crain et al., a child who has acquired the weak reading would not have access to direct truth-conditional evidence for the
existence of the strong reading, as the child could not possibly be exposed to a use of (4) in a situation in which only the strong reading is true. While we agree with this point, we also note that it presents an argument for the Semantic Subset Principle only under the additional assumption that direct truth-conditional evidence is the only type of evidence potentially useful to the child in acquiring the different readings of sentences like (4). It is this assumption, which Crain et al. do not justify, that we find questionable. After all, it is well known that focus can have a range of non-truth-conditional pragmatic effects.

One well-known effect of this sort is so-called question–answer congruence. Informally speaking and simplifying considerably, an answer to a constituent question can bear focus on a given expression only if that expression corresponds to the wh-expression in the question. This holds true in particular for answers that contain the focus-sensitive particle only. To illustrate, consider (6) and (7) below, taken from Schwarzschild (1999). Schwarzschild notes that (7) is a good answer to (6a) with stress on Marc, but not with stress on the conference. Conversely, (7) is a good answer to (6b) with stress on the conference, but not with stress on Marc.

(6)  a. Who did John see at the conference?  
     b. Where did John see Marc?

(7) He only saw Marc at the conference

Moreover, in the acceptable answers, focus can be observed to associate with only and to affect truth conditions in the expected way, yielding the entailment that Marc is the only person who John saw at the conference or that the conference is the only place where John saw Marc, depending on whether stress falls on Marc or at the conference, respectively.

It is this observation that suggests a possible way for a child to learn the strong reading of sentence (4) after first having learned the weak reading. If such a child knows the principle of question–answer congruence, he would be driven to posit the wide focus reading (5b) when exposed to sentence (4) as an answer to a question, such as in the dialogue below.

(8) Speaker A: What is the dinosaur doing?  
     Speaker B: The dinosaur is only painting a house

In this case, since the question word in (8) corresponds to the main predicate of the sentence, the child could infer on the basis of question–answer congruence that stress on a house in (4) (i.e. Speaker B’s utterance) signals focus on the main predicate paint a house. The child
could then learn the strong, wide focus reading based on the assumption that Speaker B’s answer addressed the question posed by Speaker A, thereby making up for the unavailability of direct truth-conditional evidence for the strong reading discussed above, and solving this particular instantiation of the entailment problem.

Apart from question–answer dialogues, children might also exploit the focus effect known as contrast or parallelism (e.g., Rooth 1992; Schwarzschild 1999) to infer the existence of a strong, wide focus interpretation of sentences like (4). To illustrate, note that the second disjunct of the sentence in (9) is felicitous with stress on Fred, but not with stress on talked.

(9) Either she watched a movie or she only talked to Fred

Simplifying again, the parallelism constraint at work here can be characterized as follows. With the exception of possible occurrences of only, material that is not common to both coordinates of a sentence containing disjunction must be focused. This constraint correctly excludes stress on talked in the second disjunct of (9) because such a stress could only mark narrow focus on the verb itself, leaving its complement to Fred unfocused even though this expression does not occur in the first disjunct. On the other hand, the generalization permits stress on Fred because such a stress can mark wide focus on talked to Fred, which makes the two disjunctions identical up to focused material and the occurrence of only.

We can now see how the parallelism constraint described above could be used to solve the entailment problem instantiated by (4). A child who has already acquired this parallelism constraint on disjunctions could infer the existence of the strong reading of sentence (4) when exposed to a sentence like (10), which contains (4) as the second disjunct.

(10) Either the dinosaur is washing the car or the dinosaur is only painting a house

This is because sentence (10) would violate the parallelism constraint if stress on house were taken to mark narrow focus on the object, since this would leave the verb painting unfocused even though it does not have a corresponding occurrence in the first disjunct. Given the parallelism constraint, the child would accordingly be forced to interpret this stress as marking wide focus on the verb phrase painting a house instead. In that case, the child would again learn the strong, wide focus reading based on the assumption that the speaker is obeying
an independently motivated principle and without relying on truth-conditional evidence.

There are several other focus-related effects that a child could conceivably rely on to solve the entailment problem instantiated by *only* sentences. We will mention just one more. Sentences containing *only* are often followed by qualifications of the sort illustrated in (11).

(11) The dinosaur is only painting a house, it’s not cleaning the swimming-pool

On the assumption that the speaker’s qualifications are consistent with the intended focus, the child could take the example in (11) as evidence for the existence of the strong, wide focus reading of (4). If the speaker’s intended focus was narrow focus on a house, (11) would be rather infelicitous, as demonstrated by the infelicity of the following example, where the position of *only* forces narrow focus.

(12) #The dinosaur is painting only a house, it’s not cleaning the swimming-pool

Once again, we see that it would in fact be possible for the child to learn that wide focus is available in the target grammar. In other words, upon exposure to positive evidence, children would be able to add the strong, wide focus reading.

We conclude, then, that focus association with *only*, one of the examples that Crain *et al.* (1994) use to motivate the Semantic Subset Principle, does not firmly establish the need for such a principle, since children might well be able to solve the potential entailment problem it presents by exploiting non-truth conditional sources of evidence based on conditions on focus.

Moving away from association with focus, let us now turn to a different instance of the entailment problem. We consider two cases of privative ambiguity where the weak and the strong readings differ as to the relative scope of negation and an additional operator in the sentence. Our first example in (13), taken from Goro and Akiba (2004a,b), is ambiguous as to the relative scope of disjunction *or* and negation *not*.

(13) The pig did not eat the carrot or the pepper

In one reading of (13), negation and disjunction take surface scope, that is, disjunction receives narrow scope with respect to negation. In this reading, the sentence has the unambiguous paraphrase in (14a). This interpretation is probably the most natural reading of the sentence, but it also seems possible for disjunction to be interpreted as taking inverse
scope over negation. In this inverse scope reading, the sentence can be paraphrased as (14b).³

(14)  a. The pig ate neither the carrot nor the pepper (surface scope)
     b. The pig didn’t eat the carrot or didn’t eat the pepper (inverse
        scope)

Note that the ambiguity in question is privative, as the surface scope reading entails the inverse scope reading. If the pig ate neither of the two vegetables, then of course there is at least one vegetable that the pig did not eat. Following the familiar reasoning, then, it could be argued that there is a potential entailment problem and that a child who has acquired the inverse scope reading but not the surface scope reading would be unable to acquire the latter. It might accordingly be proposed that the theory of language acquisition must assume that this situation does not arise in the first place. An argument of this sort has indeed been made by Goro and Akiba (2004a).⁴

We propose that this version of the entailment problem too might actually be solvable for the child. A plausible solution in this case could be based on the fact that disjunction participates in the familiar pragmatic phenomenon known as scalar implicature, a type of generalized conversational implicature in the sense of Grice (1975). In brief, and simplifying somewhat, the standard theory of scalar implicature states that a speaker uttering a given sentence conversationally implicates that the sentence uttered is the strongest true statement among its scalar alternatives, that is, that no stronger true statement could be formed by replacing some operator in the sentence with another operator of the same type (e.g. Horn 1972; Gazdar 1979; Sauerland 2004). In particular, since a conjunction $A \land B$ is stronger than the disjunction $A \lor B$, a speaker uttering $A \lor B$ is predicted to implicate that $A \land B$ is false. So the standard theory of scalar implicature derives the well-known observation that disjunction is often understood exclusively. It moreover predicts that in the scope of negation, disjunction does not trigger

³ With Goro and Akiba (2004), we assume that disjunction has an inclusive semantics, and that exclusive readings are due to pragmatic strengthening through a scalar implicature. We will discuss the significance of scalar implicatures in the present context shortly.

⁴ Goro and Akiba (2004) actually disagree with our assessment of the relevant facts, as they assume that (13) permits surface scope only. For them, therefore, the problem introduced by the entailment is not that the child might fail to acquire ambiguity. They propose a parameter $+/-$PPI such that disjunction must scope above negation in $+PPI$ languages and below negation $-PPI$ language. The version of Goro and Akiba of the entailment problem is that a speaker of English or any other $-PPI$ language, who has initially adopted the $+PPI$ setting would not be able to reset the PPI parameter based on truth-conditional evidence. They accordingly stipulate that the default setting of the parameter, the initial setting for speakers of all languages, must be $-PPI$, a stipulation motivated by the same logic as the Semantic Subset Principle.
a scalar implicature and hence is not exclusive. This is because a negated conjunction not \([A \text{ and } B]\) happens to be weaker, not stronger, than the negated disjunction not \([A \text{ or } B]\), so there is no stronger scalar alternative that might trigger an implicature.

Going back to the inverse scope reading of sentence (13), note that its logical form is \([\neg A \text{ or } \neg B]\). This logical form has a scalar alternative \([\neg A \text{ and } \neg B]\), which is stronger than \([\neg A \text{ or } \neg B]\), so that a speaker uttering a sentence with logical form \([\neg A \text{ or } \neg B]\) is predicted to implicate that \([\neg A \text{ and } \neg B]\) is false. Thus, at least one of the statements \(A\) and \(B\) must be true. So the inverse scope reading of (13) is (correctly) predicted to implicate that the pig ate the carrot or the pepper. In contrast, since in the surface scope reading, disjunction is interpreted in the scope of negation, no scalar implicature is predicted to arise. The complete, pragmatically strengthened, meanings of the two readings of sentence (13) can therefore be described as in (15) below.

(15)  
\begin{align*}  
\text{a. The pig ate neither the carrot nor the pepper (surface scope)} \\
\text{b. The pig didn’t eat the carrot or didn’t eat the pepper and the pig ate the carrot or ate the pepper (inverse scope)} 
\end{align*}

Note now that the two meanings in (15) are not related by entailment. Specifically, even though (a) entails (b) in (14), where scalar implicatures are suppressed, (a) no longer entails (b) in (15). Obviously, from the assumption that the pig ate neither the carrot nor the pepper, it does not follow that the pig did eat one of the two vegetables.

The result is that the entailment problem posed by (13) disappears once the relevant readings are pragmatically strengthened by scalar implicature. A child who has acquired the inverse scope reading of (13) but not the surface scope reading could add the latter, provided he masters the mechanism of scalar implicature. Specifically, such a child could infer the availability of the surface scope reading by experiencing (13) as a description of a scenario where the pig ate neither the pepper nor the carrot, a scenario where (15a) is true but (15b) is false.

Much the same comment applies to another scope ambiguity which has been used to illustrate the entailment problem and motivate the Semantic Subset Principle. Sentence (16) below, discussed in Musolino (1998) and Musolino et al. (2000), permits two readings that differ as to the relative scope of the universal quantifier and negation.

(16)  
Every horse didn’t jump over the fence

(17)  
\begin{align*}  
\text{a. No horse jumped over the fence (surface scope)} \\
\text{b. Not every horse jumped over the fence (inverse scope)} 
\end{align*}
The sentence in (16) is ambiguous between the surface scope interpretation in (17) and the inverse scope interpretation in (17). The ambiguity is privative, with (17a) entailing (17b). Musolino et al. (2000) accordingly argue that, if children’s initial hypothesis only included the inverse scope reading in (17b), they would not be able to acquire the surface scope reading (17a). However, in this case too the problem becomes solvable once the phenomenon of scalar implicature is taken into account. A negated universal of the form not [every A B] has a stronger scalar alternative not [a A B], where the universal determiner is replaced with an existential determiner. A speaker uttering a sentence with the logical form not [every A B] is therefore predicted to implicate that not [a A B] is false. So sentence (16) in its inverse scope reading (17) is predicted to implicate, correctly it seems, that some horse did jump over the fence. In contrast, the surface scope reading of (16) is not expected to carry a scalar implicature, given that a scalar alternative [a A] [not B] is weaker than the logical form [every A] [not B]. With scalar implicatures added, therefore, the two readings of (16) can be paraphrased as in (18).

(18) a. No horse jumped over the fence (surface scope)
   b. Not every horse jumped over the fence but some horse jumped over the fence (inverse scope)

Again, these pragmatically strengthened readings are not related by entailment. A child who initially acquired the inverse scope reading could acquire the surface scope reading as well by hearing (16) applied to a scenario where the surface scope reading is true, that is, a scenario where no horse jumped over the fence.

An anonymous reviewer questions the availability of events like the ones we described, given that adults seem to rarely use sentences like (16) in their surface scope reading. To be clear, we do not intend to

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5 Actually, under the textbook interpretation of universal determiners, (17a) is true but (17b) is false if there are no horses. This, however, is a potential shortcoming of the textbook analysis, as universal statements are usually understood to convey that the domain of quantification is not empty.

6 Having introduced the particular instance of the entailment problem discussed by Musolino et al. (2000), we would like to comment on an observation offered by Musolino (2006), according to which children’s documented behaviour with sentences like (16) raises an empirical problem for the Semantic Subset Principle. In particular, Musolino (2006) suggests that children’s ability to access either interpretation, documented in a study by Musolino and Lidz (2006), falsifies the claim that children initially hypothesize only the strong reading of a privative ambiguity. In our view, this is incorrect. The Semantic Subset Principle could not possibly be falsified by the observation that children have acquired an ambiguity, since that is what the Semantic Subset Principle is designed to ensure. The Semantic Subset Principle would be falsified if we found that children are initially limited to the weak reading of a privative ambiguity, whose strong reading is only acquired at a later stage. We are not aware of any study documenting this scenario.
present the relevant evidence as abundant in the input. Nevertheless, we have reasons to believe that data of the kind discussed above exist. This is confirmed by Musolino and Lidz (2006), who report that ‘one of the dozens of examples from the Musolino corpus was used to convey a “none” reading’ (p. 842). This proves our point: examples of the relevant kind exist. They may be rare, but they do exist.

Another comment on the proposal above is in order. Children’s computation of scalar implicatures is the subject of a rapidly growing body of research (for a recent review, see Guasti et al. 2005). A frequent finding is that children do not compute implicatures to the same extent as adults. As a consequence, if a child were to initially acquire only the weak reading, he might not have access to the solution described above until relatively late. However, this should not be taken as evidence against our proposal. At most, it could be taken as evidence against the claim that children go through the relevant acquisition scenario in the early stages of language development. This is not our claim, however. Our claim is simply that children could acquire the strong reading of a privative ambiguity after learning the weak reading. It might take them a long time, but the possibility cannot be excluded on logical grounds.

The Semantic Subset Principle was not proposed to ensure that children would not encounter problems that could delay their attainment of the target grammar. The Semantic Subset Principle was proposed to ensure that children would not encounter problems that could make the target grammar unattainable. Our point is that the problem discussed by Crain et al. (1994) would not make the target language unattainable.

To sum up, we have reviewed different instances of the entailment problem discussed in the literature. Overall, those instances of the entailment problem appear to be solvable. Showing that specific instances of the entailment problem can be solved, however, might not be enough to show that there is no work left for the Semantic Subset Principle. To this aim, what needs to be done is to work out a mechanism that would allow the child to solve arbitrary instances of the entailment problem. We propose such a general mechanism in section 2.3. But first, in section 2.2, we will comment on a related recent proposal in Musolino (2006) and related suggestions by an anonymous reviewer.

### 2.2 Is there really a learnability problem?

We are not the first ones to suggest that examples like (4) or (16) above do not provide a good motivation for the Semantic Subset Principle. As for (4), Musolino (2006) asks whether there are any languages where
sentences like (4) lack the strong, wide focus interpretation. If not, it is possible that the successful acquisition of this ambiguity is effectively guaranteed by Universal Grammar. In other words, the acquisition of available readings in this particular case may not in fact have to be conservative, so that a child exposed to a sentence like (4) may immediately posit the ambiguity without ever having to face any learnability problem. Echoing similar remarks in Musolino (2006), an anonymous reviewer moreover suggest that example (16) is not a good illustration of the entailment problem either, arguing that the availability of the strong, surface scope, reading is effectively guaranteed by Universal Grammar as well, specifically by the assumption that meaning is determined compositionally.\(^7\)

These considerations question the motivation for the Semantic Subset Principle, suggesting that the relevant instances of the entailment problem are preempted independently of such a principle by certain properties of Universal Grammar. By the same token, they also question the need for the solutions to these particular instances of the entailment problem that we have presented above.

However, we think that the suggestion put forth by Musolino (2006) and the reviewer fall short of showing that there is no work left to do for the solutions we have proposed. With regard to examples like (4), it remains to be shown that indeed all language allow for both wide and narrow focus readings; hence, whether it can indeed be argued that Universal Grammar excludes languages where only the narrow focus reading is available. After all, it is certainly conceivable that languages could differ as to the relation between stress and focus width.

Also, the suggestion that the surface scope reading of examples like (16) is guaranteed by compositionality seems to us to be based on a misunderstanding. We are not aware of any existing explication of the notion of compositionality that would guarantee the availability of surface scope readings. Indeed, such an explication would be inadequate for empirical reasons. This is illustrated by a finding reported in recent acquisition literature: Kräm er (2000) has shown that Dutch-speaking children interpret scrambled indefinites in their underlying position up until age 9 (see also Unsworth 2005). In fact, Musolino (2006) moreover suggests that knowledge of syntactic structure of the target language can allow a language learner to solve a potential entailment problem. To illustrate this possibility, Musolino suggests that a learner of English could infer the existence of an inverse scope reading of an example like (16) after having learned that subjects in English originate within the verb phrase. While we consider it plausible that the syntax of the target language could help a learner solve certain instances of the entailment problem, we are doubtful about Musolino’s illustration of this idea. After all, the inverse reading of (16) is not the problematic reading: being the weak reading, its existence can be inferred on the basis of purely truth-conditional evidence.

\(^7\) Musolino (2006) moreover suggests that knowledge of syntactic structure of the target language can allow a language learner to solve a potential entailment problem. To illustrate this possibility, Musolino suggests that a learner of English could infer the existence of an inverse scope reading of an example like (16) after having learned that subjects in English originate within the verb phrase. While we consider it plausible that the syntax of the target language could help a learner solve certain instances of the entailment problem, we are doubtful about Musolino’s illustration of this idea. After all, the inverse reading of (16) is not the problematic reading: being the weak reading, its existence can be inferred on the basis of purely truth-conditional evidence.
any experimental maneuver that has been tried has failed in getting Dutch-speaking four-year-olds to access the adult surface scope reading (see Unsworth & Gualmini 2007; Unsworth & Helder 2007). Descriptively, it looks as if Dutch-speaking children indeed initially lack the surface scope reading that, according to the reviewer, should be hypothesized from the beginning.

It should moreover be obvious that even if one could successfully argue that Universal Grammar preempts particular instances of the entailment problem, such as those illustrated by (4) and (16), this would not yet amount to an argument that the Entailment Problem in general is a non-problem, as such an argument would of course require an exhaustive survey of privative ambiguity in natural languages. So we are not ready to concur with Musolino (2006), who concludes that ‘semantic subset problems probably do not exist in the first place’.

By the same token, of course, the solutions to the relevant instances of the entailment problem we have proposed also fail to establish that there is no need for the Semantic Subset Principle in the general case. Such a case would have to be based on a general solution to the entailment problem. We will now proceed to presenting such a general solution.

2.3 A general solution: exploiting downward entailingness

We would like to propose that sentences containing so-called downward entailing operators, operators that reverse entailment relations within their arguments, could provide children with positive truth-conditional evidence that allows them to solve arbitrary instances of the entailment problem. Let us illustrate the mechanism we have in mind by returning to the association with focus example in (4), repeated below for convenience.

(4) The dinosaur is only painting a house

(5) a. a house is the only thing that the dinosaur is painting (narrow focus)
   b. painting a house is the only thing that the dinosaur is doing (wide focus)

According to Crain et al. (1994), a child who has acquired the weak reading (5a) would not encounter truth-conditional evidence in favour of the strong reading (5b). To be sure, if the necessary truth-conditional evidence could only come from the occurrence of (4) in a situation in which only the strong reading is true, then Crain et al.’s claim is unobjectionable, as no such situation exists. Nevertheless, one should
also consider the possibility that the child can receive truth-conditional evidence from sentences other than (4) and in turn use this piece of information to draw conclusions about (4).

We propose that a child who has acquired the weak, narrow focus, reading of (4) could add the strong, wide focus, reading after first acquiring a wide focus reading of a sentence where only occurs in the scope of a downward entailing operator. One such downward entailing operator is sentential negation, so let us consider the negated version of (4), shown in (19), and its two readings paraphrased in (20).

(19) The dinosaur is not only painting a house
(20) a. a house is not the only thing the dinosaur is painting (narrow focus)
    b. painting a house is not the only thing the dinosaur is doing (wide focus)

Like the ambiguity of (4), the ambiguity of (19) is privative. However, the effect of negation in (19) is that the direction of entailment has been reversed, so now the narrow focus reading entails the wide focus reading. If the dinosaur painted something other than a house, then he also did something other than painting a house.

Now suppose a child has acquired the weak, narrow focus, reading of (4). Presumably, such a child will thereby also have acquired the narrow focus reading of (19). The child could now add the wide focus reading of (19) when exposed to the sentence in a scenario where (20b) is true while (20a) is false. This could be a scenario, for example, where the dinosaur is painting a house and is painting nothing else, but is also eating a sandwich. Having concluded that wide focus is available, the child could then infer that (5b) is a possible reading for (4). In this way, the child could in principle acquire the two readings in (5), even if he initially assumed that only narrow focus is available.

As another illustration, we apply the proposed mechanism to the scopally ambiguous example in (16) above. Suppose a child has acquired the weak, inverse scope, reading of (16) in (17b). Such a child could add the strong, surface scope, reading when exposed to a sentence like (21), where (16) is embedded under impossible. This is a downward entailing adjective, so the direction of entailment attested in (17) is reversed in (22): the inverse scope reading now entails the surface scope reading.

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8 Recall from section 1 that this is the very type of scenario the child could use to add the weak, narrow focus, reading of (4) after initially having acquired the strong, wide focus, reading.
(21) It's impossible that every horse didn't jump over the fence
(22) a. It's impossible that no horse jumped over the fence (surface scope)
    b. It's impossible that not every horse jumped over the fence (inverse scope)

Suppose a child has initially acquired the weak, inverse scope, reading of (16), and has thereby also acquired the inverse scope reading of the embedded clause in (21). The child could add the surface scope reading of the embedded clause when exposed to (21) in a scenario where (22a) is true while (22b) is false, that is, a scenario where it is known that some horse jumped, but also that some horse may not have jumped, perhaps because of a broken leg. Having concluded that surface scope is available for an embedded occurrence of (16), the child could then infer that (16) in isolation has a surface scope reading as well. So the child would acquire the two readings of (16), even if he initially assumed that only inverse scope is available.

Unlike the focus or implicature-based solutions presented in the previous section, the mechanism described here is completely general in that it applies to privative ambiguities of all kinds. The obvious question at this point is whether sentences with downward entailing operators that would point a child in the right direction indeed occur in the child’s input.

A quantitative analysis of the input available to children is beyond the scope of this paper. We note, however, that Crain et al.’s (1994) Principle of Parsimony mentioned in section 1 above, according to which adults prefer weak readings of sentences that have a privative ambiguity, would help make the relevant reading adults’ preferred interpretation of sentences containing a downward entailing operator. We have argued that children could use truth-conditional evidence to add the strong reading to the weak reading of an ambiguous sentence. In particular, children would need to hear a sentence in which the relevant construction is in the scope of a downward entailing operator and the intended reading is generated by the same mechanism that would generate the strong reading of the original construction. Crucially, however, this amounts to the weak reading of the construction containing the downward entailing operator. So assuming the Principle of Parsimony is correct, unless we have reasons to believe that adults’ assumed preference for weak readings does not carry over to sentences containing downward entailing operators, it seems plausible to hypothesize that the required evidence would indeed be available.
Even if it turned out that the Principle of Parsimony is wrong and that for some reason adults do not always prefer the weak reading of any given sentence, we think that one should not dismiss the necessary evidence as non-existent. We base this belief on the results of an informal internet search for scopally ambiguous sentences of the type discussed above. Notice that such a search stacks the cards against our proposal beyond necessity. In real life, it seems reasonable to assume, like Crain et al. (1994) do, that the child has access to contextual information that would be used to rule out some logically possible meanings while permitting others. By contrast, in our own search we had to restrict our observations to cases where such information could be inferred from the very same context surrounding the relevant utterance. Despite this unnecessary restriction, our search returned many sentences that would force the adoption of the surface scope interpretation. Two relevant examples are presented in (23).

(23)  
   a. “There is absolutely no question in my mind that this is the proper way to handle bone growth in young horses,” said Fisher. “It’s not a guarantee that every horse won’t buck his shins because there’s an exception to every medical rule www.ctba.com  
   b. No big deal, because it’s not as though every person didn’t get it, but I hope people figure this out theconstructivecurmudgeon.blogspot.com

In both cases, the surface scope reading is clearly intended by the writer, as the reading where every takes inverse scope under negation is too strong to be pragmatically consistent with the context provided: the inverse scope reading of (23a) would convey that every horse might buck his shin, and the inverse scope reading of (23b) would convey that every person got the point. Cases of this sort, then, could in principle help children in solving the particular instantiation of the entailment problem posed by sentences like (16), that is, they could allow children to acquire the surface scope reading in (17a) after initially having learned the inverse scope reading in (17b).

Let us summarize the proposed mechanism. Given a sentence S and two logically possible readings $S_A$ and $S_B$, where $S_A$ entails $S_B$, we have argued that children could acquire both readings on the basis of truth-conditional evidence, regardless of which reading was posited first. If the child’s first hypothesis is that only $S_A$ is available, then all the child needs to experience is an utterance of $S$ in a context in which reading $S_A$ is false, but $S_B$ is true. By contrast, if the child’s first hypothesis is that only $S_B$ is available, then evidence for the existence of $S_A$ might come
from an utterance that receives the logical form $\text{OPDE}_S$, where $\text{OPDE}$ is any downward entailing operator. In this case the mechanisms that generate $S_A$ and $S_B$ would generate $\text{OPDE}_S A$ and $\text{OPDE}_S B$, respectively, where $\text{OPDE}_S B$ entails $\text{OPDE}_S A$. In this case, the child could receive truth-conditional evidence in favour of $\text{OPDE}_S A$ by simply witnessing an occurrence of $\text{OPDE}_S$ in a context that makes $\text{OPDE}_S A$ true and $\text{OPDE}_S B$ false. Then, the child would need to infer that the mechanism that generates $\text{OPDE}_S A$ would also be available for the original sentence $S$, thereby acquiring $S_A$.

We note again that the path to the acquisition of privative ambiguities proposed by Crain et al. (1994) and the one we proposed are on equal footing in that, by the Principle of Parsimony, the weak reading that the child is assumed to add later ($S_B$ or $\text{OPDE}_S A$) is predicted to be adults’ preferred reading of the relevant sentence ($S$ or $\text{OPDE}_S$), which in both cases increases the likelihood that, for each sentence, the child’s experience would provide him with evidence for the weak reading of that sentence, that is, $S_B$ or $\text{OPDE}_S A$. Finally, we note that, if $S$ can have the strong reading $S_A$ but, at the same time, reading $\text{OPDE}_S A$ was unavailable for any sentence $\text{OPDE}_S$, the mechanism we have proposed would fail. We are not at present aware of any case of this sort.

In concluding this section, we would like to point to a feature of our proposal that may be considered problematic and that connects the entailment problem discussed here to the expunction problem introduced in section 1. Note that for our account to work, we must allow the child to draw analogies from sentences that contain a downward entailing operator to sentences that do not. This raises the possibility that the child might draw wrong generalizations. To illustrate, consider sentence (24).

(24) I didn’t read the books

The sentence is understood to convey that the speaker did not read any of the books, illustrating Fodor’s (1970) observation that, under sentential negation, plural definite noun phrases are typically interpreted as though they were narrow scope existentials. Accordingly, upon being presented with (24) in a context in which the speaker did not read any of the relevant books, a child might infer that definite plurals can be existentials. Now suppose the child brings this piece of evidence to bear on the interpretation of (25).

(25) I read the books

According to our reasoning, the child might be led to interpret the definite in (25) as an existential quantifier, on a par with (24). This
would lead the child to a non-adult interpretation, however, as adult speakers of English must assign universal force to the definite in (25), taking the sentence to convey that I read all of the books and not just some of them. The question then is whether children would ever be able to recover from such a mistake. If the only way for children to recover from their mistake draws upon the use of negative evidence, under current assumptions, we would have to conclude that children would never recover.

So while the mechanism that we have proposed might indeed allow the child to solve the entailment problem, this result comes at a potential cost: the child may solve the entailment problem, but at the possible cost of running into the expunction problem. So if the expunction problem is unsolvable and the Subset Principle can be motivated on logical grounds, then our proposal faces a serious challenge. In the remainder of this paper, we address this challenge by proposing a potential solution to the expunction problem.

3. A SOLUTION TO THE EXPUNCTION PROBLEM:
   POSITIVE EVIDENCE AND HEARER CHARITY

The Subset Principle, as it was formulated by Wexler and Manzini (1987) (see also Wexler & Culicover 1980), is designed to ensure that language acquisition proceeds solely on the basis of positive evidence. Given that ungrammatical sentences are not labelled as such in the primary linguistic data, the child should never entertain a grammar that generates a superset of the well-formed sentences of the target language. If such a scenario arose, the child would not be able to expunge the ungrammatical forms from his grammar.

When it comes to syntactic well-formedness, this reasoning is supported by the finding that children indeed do not receive negative evidence (see Brown & Hanlon 1970; Marcus 1993). However, we think that this reasoning might not apply to sentence meanings. What sets aside sentence meanings is the fact that when speakers produce false statements, the other participants to the conversation might object. In other words, dialogue participants might not object to any speaker whose utterances are not fully grammatical, but they are very likely to object to a speaker whose utterances lack true interpretations. Not surprisingly, this also holds true when children produce false statements (see Brown & Hanlon 1970).

In order to illustrate our point, let us return to the case of long-distance reflexives, used in section 1 to introduce the expunction problem. We take it that a speaker who produces a sentence with an
embedded reflexive is likely to be confronted by an adult listener who considers the local dependency interpretation false—even if that listener considers the proposition that the unavailable long-distance reading would express to be true. To illustrate, consider the constructed dialogue in (26) below.

(26) Speaker A: John wanted Bill to shave himself.
Speaker B: No, actually, John had no problem with Bill’s beard.

Speaker B’s response is pragmatically well formed (assuming that Speaker B indeed believes that John did not want Bill to shave). This is so even if Speaker B believes that John wanted to be shaved by Bill, the proposition the potential long-distance reflexive interpretation would express. After all, this reading is actually unavailable in the adult grammar and so it is irrelevant for the pragmatic well-formedness of the discourse at hand.

Consider now the hypothetical case of a child who has incorrectly posited a long-distance reading of embedded reflexives in addition to the local interpretation. Suppose this child is Speaker A in (26) or witnesses the exchange as a third person. Suppose moreover that it is known in the utterance context that John indeed wanted Bill to shave him, that is, that the hypothetical long-distance reading is true. Alternatively, suppose Speaker B’s explicitly indicates that the long-distance reading is true, perhaps by continuing as shown in (27).

(27) Speaker A: John wanted Bill to shave himself
Speaker B: No, actually, John had no problem with Bill’s beard, but John wanted to get a shave from Bill

Arguably, the child could then infer that the long-distance interpretation is not actually available in the adult grammar. The child could reason that, if such a long-distance reading were available, Speaker B would have been able to access it and would accordingly not have objected to Speaker A’s utterance on the grounds of it being false. By drawing this inference, then, the child would expunge the unavailable long-distance interpretation from his grammar.

A central premise in the child’s inference is the assumption that listeners interpret speakers’ utterances charitably in the sense that they refrain from rejecting an utterance as false as long as an interpretation is available that they do not consider false (and possibly believe to be true). Without this charity assumption, the exchanges in (26) and (27) would not support the relevant inference, as Speaker B could be taken to arbitrarily have accessed one of two interpretations available in the adult grammar.
We believe that listeners are indeed charitable in the relevant sense and that speakers and other conversation participants expect them to be. To illustrate, in the absence of a disambiguating context, Speaker B’s response in (28) below is pragmatically deviant because it portrays Speaker A’s utterance as false, interpreting he as being anaphoric to Bill, even though Speaker B seems to agree with the other possible reading of the sentence, the one where he is instead anaphoric to John.

(28) Speaker A: John told Bill that he won
Speaker B: No, actually, John declared himself the winner

We note that dialogues like the one in (27) do not count as negative evidence in the usual sense, because no dialogue participant is explicitly pointing out the unavailability of a given meaning. Furthermore, the mechanism we described is different from so-called indirect negative evidence (Chomsky 1981), since the child does not carry out an inference on the basis of what he could have heard but did not hear. Rather, the unavailability of a given meaning can be inferred on the basis of the charity assumption. Thus, a dialogue between competent adult speakers, which we would classify as positive evidence, could be used to infer the unavailability of a specific reading, a result which is traditionally seen as a prerogative of negative evidence. In the learning scenario described here, the evidence in question is negative only in the sense that it can support the inference that a certain interpretation is not available.

Recent work in the acquisition of semantics report experimental results that our proposal might help explain. O’Leary and Crain (1994), Musolino (1998), Gualmini (2004) and Gualmini et al. (2008) report that English-speaking children may assign to the determiner some both wide and narrow scope with respect to clausemate negation. For example, these children can interpret The detective didn’t find someone as conveying either that there is someone the detective did not find, the inverse scope reading, or that the detective found no one, the surface scope reading. On the assumption that some is a positive polarity item in adult English and hence cannot take surface scope in such cases (see e.g. Ladusaw 1979), children may therefore face the acquisition

9 Listener charity is naturally related to Grice’s (1975) Cooperative Principle. Listeners might be said to be charitable in the relevant sense because they expect speakers to abide by the Maxim of Quality.

10 The pragmatic deviance of Russell’s (1905) famous yacht example makes much the same point, and more dramatically so: ‘I have heard of a touchy owner of a yacht to whom a guest, on first seeing it, remarked, ‘I thought your yacht was longer than it is’; and the owner replied, ‘No, my yacht is not longer than it is’’. The yacht owner objects to the guest’s utterance by assigning it a the contradictory interpretation I thought your yacht was longer than itself even though a consistent interpretation, presumably intended by the guest, is readily available as well.
problem that the Subset Principle is expected to prevent. The question is how children manage to solve that problem.

One candidate is indirect negative evidence (Chomsky 1981). Upon being presented with numerous occurrences of sentence containing *some* and negation in which *some* is interpreted outside the scope of negation and no sentence in which *some* is interpreted in the scope of negation, the learner would infer that the latter interpretation is not available. Appealing as it may be, under this scenario, it is surprising that four- and five-year-olds have still not expunged the relevant interpretation.

As an alternative explanation, we propose that under the charity assumption, positive evidence provided by hypothetical dialogues like the one below could lead the child to rid his grammar of the interpretation in which *some* is interpreted in the scope of negation. 11

(29) Speaker A: Some pizzas were not lost
    Speaker B: Well, actually, no pizza was lost!

Given that Speaker B signals disagreement with Speaker A’s utterance (*well, actually . . .*) and states that no pizza was lost, the question is what grammar can be attributed to Speaker B. The relevant reasoning is similar to the argument made on the basis of (27). Speaker B’s response indicates that he takes the potential inverse scope reading of Speaker A’s utterance to be true. If the inverse scope reading was indeed available, charity would therefore require that Speaker B accept Speaker A’s utterance as true, no matter what other readings the sentence might have. Thus, Speaker B’s actual response would arguably lead a listener to infer that the inverse scope reading is not in fact available.

The remaining step is to explain why Speaker B’s utterance is pragmatically well formed under the assumption that only the surface scope reading is available. Note that Speaker B’s statement that no pizza was lost is semantically consistent with the surface scope reading of the sentence. This is because the scope ambiguity at hand is privative, with the surface scope reading being entailed by the inverse scope reading: if no pizzas were lost, then there is some pizza that was not lost. 12 So it would seem at first sight that Speaker B has no grounds for disagreement with Speaker A’s utterance. However, this apparent conflict dissolves

11 Musolino et al. (2000) take another approach to the problem at hand, relating the acquisition of *some* to the acquisition of *any*. These authors propose that once the child learns that *any* can be interpreted in the scope of clausemate negation, he will infer that its ‘allomorph’ *some* cannot be so interpreted. This proposal is of course consistent with our own. There may well be more than one way of expunging readings where *some* scopes under clausemate negation.

12 To be more accurate, this entailment holds only in situations where there are pizzas in the domain, but the relevant situations in the experiments reported in O’Leary and Crain (1994), Gualmini (2004) and Gualmini et al. (2008) were of this sort.
once scalar implicatures are taken into account. The surface scope reading of Speaker A’s utterance in (29) has the logical form \([\text{some A} \, \neg \text{not B}]\), which has the stronger scalar alternative \([\text{every A} \, \neg \text{not B}]\). Speaker B is therefore expected to take Speaker A to implicate that this stronger statement is false, hence that some pizza was lost. So Speaker B’s utterance is naturally understood as challenging this scalar implicature.

In sum, then, Speaker B’s decision to object to the scalar implicature that some pizza was lost, triggered by his interpretation of Speaker A’s utterance, signals that Speaker B has no choice but to access the interpretation that gives rise to such an implicature, that is, the surface scope interpretation of Speaker A’s utterance.

It is important to stress the role of scalar implicatures for the particular acquisition scenario we just presented. We have noted above that children do not compute implicatures to the same extent as adults. It has been found, in fact, that many children do not compute scalar implicatures until age five (Guasti et al. 2005). Interestingly, this is precisely the age when children stop interpreting \textit{some} in the scope of negation. In the acquisition scenario we are envisioning, then, the necessary information might have been available to children well before the switch happens, but they were not in the position to use it. Before they acquire scalar implicatures, children would not be expected to find any coherent interpretation of dialogues like (29) and they should not be able to use them to infer that \textit{some} must scope above clausemate negation.

Two comments about the dialogues described above. First, we emphasize that the child does not need to participate in the dialogue, that is, the child may be Speaker A, but could also just be overhearing the conversation. In other words, our proposal about the use of positive evidence from dialogues in order to expunge readings from the child’s grammar does not require that the child actually uses the reading that needs to be expunged. This sets apart the present case from the use of negative evidence to expunge ungrammatical structures. Second, Speaker B does not necessarily intend to inform Speaker A of the unavailability of a specific interpretation. Speaker B is not trying to let Speaker A know that their grammars are not identical. Speaker B might simply hypothesize that Speaker A was assuming a different domain of quantification or that Speaker A did not have access to the same information available to him.

Whatever the reason behind (Speaker B’s conjecture about) Speaker A’s failure, these kind of dialogues could in principle take place. A reasonable question is whether they are likely to take place in real life, that is, whether dialogue participants indeed object to statements whose implicatures are not met. The internet posts in (30) below suggest that
they do. These dialogues demonstrate that when an implicature is false, dialogue participants can object or request clarification.13

(30) a. i like it what do you mean ok??? i think it’s great. the pics look good too. you’re the first five i’ve given in a while. lol i better start giving more
http://www.blogskins.com
b. What do you mean “most”? Are there some banks they wouldn’t have controlled?
http://www.wellingtonpublications.com
c. WARM?! WARM?!!!? What do you mean it’s warm?? It’s HOTTER than hell out here
http://profile.myspace.com

Given these attested cases, one would expect to also find real-life exchanges analogous to (29), featuring some and a clausemate sentential negation. Indeed, the example below is precisely of this type.

(31) what do you mean somebody didn’t show up to work . . . are you still showing up?!
http://profile.myspace.com

In this example, the speaker’s question are you still showing up?! challenges the implicature triggered by wide scope some, namely the implication that someone still shows up to work. To be sure, this challenge would be uncharitable if the speaker were able to interpret some in the scope of negation, accessing the reading that no one shows up to work. So this dialogue too could lead a learner to infer that some cannot in fact be interpreted in the scope of clausemate negation.

The final example we present is a potentially problematic case suggested to us by an anonymous reviewer. The reviewer considers the hypothetical dialogue in (32) below.

(32) Speaker A: Every horse didn’t jump over the fence
Speaker B: Well, actually, none of the horses did

Note that speaker B’s reply in (32) violates the assumption of charity. The content of speaker B’s utterance indicates that he considers the proposition expressed by the surface reading of speaker A’s utterance to be true, yet the form of the reply (well, actually . . . ) signals disagreement with speaker’s A statement, indicating that speaker B uncharitably takes speaker A to have intended the inverse scope reading. The reviewer

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13 This is of course not surprising, given that speakers often judge sentences to be false if they are associated with a scalar implicature that is false (see e.g. Bott & Noveck 2004).
suggests that (32) is nevertheless a conceivable exchange. Speaker B may simply be unaware of the surface scope reading of speaker A’s utterance, a performance error that could be related to the findings of Musolino and Lidz (2006) that adults rarely use sentences like speaker A’s in the surface scope interpretation. The reviewer points out that if exchanges like (32) indeed occurred, they could lead the child to incorrectly expunge the relevant surface scope readings from his grammar.

We agree with the reviewer’s reasoning. What remains to be seen, though, is whether such non-charitable performance errors occur with sufficient frequency to actually trigger expunction of a reading available in the adult grammar. If they do, the reading in question would need to be reintroduced to the child’s grammar on the basis of positive evidence. In the particular case at hand, where the expunged reading is a strong reading, the evidence in question would have to be of the type described in the previous section.

To conclude, we have argued that when it comes to sentence meanings, the Subset Principle is not in fact a conceptual necessity, as the expunction problem is solvable in principle. The availability of a solution is tied to the existence of dialogues that would violate basic pragmatic principles, if the target grammar corresponded to the biggest language generated by the possible values of a parameter. If the expunction problem can be solved, there is no obvious reason to assume that it is avoided. A task that we leave for future research is that of establishing the amount of evidence of the relevant sort that is available to children, a necessary step to explain how children might make use of the input in order to choose among the options made available by Universal Grammar (see Yang 2003). At the present time, we would simply like to offer a speculation. We do not expect examples like the ones above to be pervasively available in the input. We regard this as a promising feature, though, as it might help explain why children seem to take so long to expunge the interpretation in which negation takes wide scope and why adult speakers seem to differ with respect to the strength of the polarity sensitivity of some.

4. CONCLUSION

In this paper, we started by considering a fairly specific proposal due to Crain et al. (1994) and we finished by challenging a very influential view about language acquisition that dates back to Wexler and Culicover (1980). Our main concern was the logical motivation for the Semantic Subset Principle proposed by Crain et al. (1994) and the Subset Principle proposed by Wexler and Culicover (1980). We argued
that the presence of downward entailing operators in natural languages and the fact that false—or even simply pragmatically odd—statements are often challenged undermines the need for the Subset Principle and the Semantic Subset Principle in the acquisition of semantics. When it comes to sentence meanings, there is no logical problem of language acquisition, but simply an empirical one. This does not mean that the acquisition of sentence meanings is a trivial enterprise. Children’s ability to solve that problem presupposes their understanding of negation (and downward entailmentness) and, in particular cases, their ability to compute scalar implicatures. Thus, the child might indeed have to face several problems before he has access to the tools that would allow him to solve those problems. Eventually, however, the child would be in the position of solving those problems that previous literature deemed as unsolvable.

The existence of potential solutions to the semantic learnability problems in question, such as the particular solutions we have outlined, shows that the Subset Principle and the Semantic Subset Principle are not conceptual necessities. Going one step further, one might ask whether these principles are even feasible as components of comprehensive theories of language acquisition.

It is in fact not obvious that they are. To begin, Musolino (2006) raises the following objection against the Semantic Subset Principle. The principle seems to imply that a child must in the relevant cases have access to both possible readings of a potentially ambiguous sentence, only to then apply the Semantic Subset Principle and to (initially) posit a grammar that permits only one of these two readings. In effect, for the Semantic Subset Principle to apply, the child must have access to the reading that the very same principle is designed to prevent or delay. To be sure, we agree with Musolino that this would be an unreasonable acquisition scenario.

We note, however, that as a conceptual argument against the Semantic Subset Principle, Musolino’s objection is incomplete. The hypothesis put forth by the Wexler and Manzini (1987) is that parameters may have default values. So the Semantic Subset Principle could be viewed as a proposal concerning the default settings of certain parameters. In this view, the child would not in fact need to assess entailments among two potential readings. Instead, default settings would dictate that initially only strong readings are available; hence, there would be no need for the child to determine entailments before settling on an initial interpretation.

This version of the Semantic Subset Principle is not subject to the particular objection raised by Musolino (2006). However, one still
needs to ask what the relevant parameters and their default values would look like. To illustrate, consider the case of a universal quantifier and clausemate negation. Since the reading in which every takes scope over negation entails the other reading, there would presumably have to be a parameter whose default value ensures that that reading is available. But upon closer reflection, it is apparent that such a default setting would not in fact derive the intended effect of the Semantic Subset Principle. After all, we have seen that a higher downward entailing operator can reverse the direction of entailment, so that the reading in which negation takes wide scope ends up entailing the other reading. The parameter in question and its default value would have to be sensitive to that complication. We are doubtful that this requirement can be met in a sufficiently constrained theory of parameters. Hence, like Musolino, we remain unconvinced that the Semantic Subset Principle is tenable as a constraint on language acquisition.

As for the Subset Principle, the computational models of language acquisition have had a hard time encoding the requirements expressed by it (see Fodor & Sakas 2005). Also, the Subset Principle has been presented as a constraint on parameter setting, yet the parameter setting model of language acquisition is not without alternatives. The Variational Learning model proposed by Yang (2003) is one alternative. Not having been designed to preempt the expunction problem, it seems that this model could rely on a solution to this problem of the sort offered here.

It will be useful to elaborate on this point. To illustrate, Yang (2003) attempts to explain how a child might succeed in attaining the target grammar even if he was free to draw upon any grammar made available by Universal Grammar (UG). On this view, the process of language acquisition starts off as a random walk. In principle, the child is free to select any grammar that is made available by UG according to the probability associated with that grammar. Learning is taken to amount to a re-adjustment of the probability associated with each grammar. For any piece of input, if the grammar which happens to be selected by the child successfully analyzes that piece of input, the probability associated with that grammar increases while the probabilities associated with all other grammars decrease. By contrast, if the grammar selected by the child does not allow him to analyze the input encountered by the child, then the probability associated with that grammar is decreased and the probabilities associated with all other grammars are increased. Crucially, on this model, the input is only used to ‘test’ one grammar at a time, but the results of this test have consequences for the probability associated with each grammar. In the long run, the occurrence of
experience that cannot be analysed by any grammar other than the
target grammar ensures that the probabilities associated with non-target
grammars decrease. The problem is that, in the scenario which the
Subset Principle is expected to prevent, there does not seem to be any
evidence that could not be accounted by the grammar associated with
the superset language. Thus, it is not clear whether the target subset
grammar could ever win if the learner happened to draw upon
a grammar that generates a superset of the meanings licensed by the
target grammar. On such a scenario, the grammar selected by the
learner would always be rewarded and all the competing grammars
would be punished—including the target grammar. If the learner
embarked on an unlucky strike, the child might never be able to
decrease the probability of accessing the superset grammar and that
grammar might end up being adopted by the learner. In other words,
although the Variational Learning model provides us with several
advantages over the parameter setting model, it does not provide us
with a solution to the expunction problem. As a consequence, unless
a solution to the expunction problem can be put forward, it seems as
though the initial steps of the learner must be set, a conclusion that
seems at odds with the view of language acquisition as a ‘random walk’
among possible grammars.

Against this background, one could view our contribution as an
enrichment of the kind of evidence that would lead the child to punish
any given grammar. It is often assumed that the child receives valuable
information by encountering a structure that would not be licensed by
his current grammar. Similarly, it is often assumed that the child
receives valuable information by encountering a sentence for which no
true interpretation would be generated by his current grammar. In our
view, the child might also receive valuable information by encounter-
ing a sentence which is well formed and true—but pragmatically
infelicitous—according to his current grammar.

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ANDREA GUALMINI
Utrecht Institute of Linguistics OTS
Janskerkhof 13
3512 BL Utrecht
The Netherlands
e-mail: andrea.gualmini@let.uu.nl

BERNHARD SCHWARZ
Department of Linguistics
McGill University
1085 Dr. Penfield
Montreal, QC H3A 1A7
Canada
e-mail: bernhard.schwarz@mcgill.ca

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