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Bare Plurals, Bare Conditionals, and *Only*

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Abstract

The compositional semantics of sentences like *Only mammals give live birth* and *The flag flies only if the Queen is home* is a tough problem. Evidence is presented to show that *only* here is modifying an underlying proposition (its 'prejacent'). After discussing the semantics of *only*, the question of the proper interpretation of the prejacent is explored. It would be nice if the prejacent could be analyzed as having existential quantificational force. But that is difficult to maintain, since the prejacent structures when encountered on their own are naturally read as having a lawlike flavor, which in many analyses is attributed to the semantics of implicit operators alleged to be present in them. In the end, an analysis is presented which attributes some very particular properties to these operators and thereby succeeds in providing the target sentences with intuitively adequate interpretations. These complex constructions can therefore be used as a probe into the nature of implicit quantification in natural language.

1 INTRODUCTION

We will attempt to provide a compositional semantics for the following kinds of examples:

(1) a. Only mammals give live birth.
    b. The flag flies only if the Queen is home.

What do such sentences mean and how do they come to mean what they mean?

The overall meaning of our target sentences is reasonably clear. (1a) excludes the possibility that among a realm of relevant individuals there are any who give live birth but are not mammals. (1b) excludes the possibility that the flag flies in circumstances other than ones in which the Queen is home. Apart from these negative claims, both sentences also seem to impose positive requirements. (1a) is taken to signal that some (or even all?) mammals give live birth. (1b) seems to signal that the flag does in fact fly if the Queen is home. We'll get more precise later on.

There are two main avenues of analysis: (i) *only* modifies an underlying proposition, or (ii) *only* relates two subconstituents.

Option (i): If we surgically remove *only* from these sentences, we are left with sentences that involve bare plurals or bare conditionals:

(2) a. Mammals give live birth.
 b. The flag flies if the Queen is home.

The idea behind Option (i) is that the logical form of the sentences in (1) involves *only* combining with essentially the structures in (2):

(3) a. only [mammals give live birth]
 b. only [the flag flies if the Queen is home]

This approach receives some initial plausibility from the fact that the following (slightly artificial) sentences seem equivalent to our target sentences:[1]

(4) a. It is only true that $[\text{MAMmals}]_F$ give live birth.
 b. It is only true that the flag flies if $[\text{the QUEEN is home}]_F$.

Medieval scholars called the structure that *only* appears to combine with its prejacent, a convenient term that I will adopt.[2] The term bare plural as applied to sentences like (2a) should be familiar. The term bare conditional for a sentence like (2b) derives from a particular view of conditional sentences which assumes that *if*-clauses typically restrict some kind of (quantificational) operator, a view to be discussed later. Bare conditionals like the one in (2b) contrast with explicitly quantified or modalized conditionals such as *The flag always flies if the Queen is home.* If we pursue Option (i), we have to spend some time on saying what the prejacent structures mean. We will see that it would be nice if they could be analyzed as having existential quantificational force. But that is difficult to maintain, since the sentences in (2) by themselves are naturally read as having a lawlike flavor, which in many analyses is attributed to the semantics of implicit operators alleged to be present in them. To provide an adequate analysis of our target sentences, we will have to attribute some very particular properties to these implicit operators. Within such a view, we can use the semantics of the sentences in (1) as a probe into the semantics of lawlike statements.

Option (ii): The competing analysis would maintain that the sentences in (2) do not represent any ingredient of the structure of the sentences in (1). Instead, the idea behind Option (ii) is that in the logical form of the sentences in (1) *only* is a quantificational element relating two constituents: two predicates in (1a) and two clauses in (1b):

(5) a. only [mammals] [give live birth]
 b. only [if the flag flies] [the Queen is home]

To specify the meaning of *only* is in such structures, we could draw inspiration from the logic textbook doctrine about the sentences in (1). What we are told is that *only As are Bs* is equivalent to *all Bs are As*: *only* is the converse of *all*. It is further claimed that *only if p, q* is equivalent to *if q, p*: *only if* is the converse of *if*. So, our sentences in (1) are said to be equivalent to these ones:

(6) a. All animals that give live birth are mammals.
    b. If the flag flies, the Queen is home.

While there does seem to be something right to these logical teachings, the recipe that gets us from (1) to (6) can't be quite right.

First, it is often thought that *only* triggers a certain kind of presupposition (or implicature, or what have you; we'll discuss this a little further in section 3). For example, *only John left* is said to presuppose that John left. Similarly, *only if p, q* is said to presuppose that *if p, q* is true as well. Of course, the latter can't be an entailment; otherwise *q only if p* would be equivalent to *q if and only if p*, which it isn't. Now clearly *if q, p*, which is the converse of *only if p, q*, does not presuppose *if p, q*. Hence, convertibility can only be said to hold as long as we ignore presuppositions. Perhaps, the champion of convertibility should maintain that while *only if p, q* is not equivalent to *if q, p*, it does entail it. Similarly, *only As are Bs* may not be equivalent to *all Bs are As* but it might entail it.

The second reason why the convertibility doctrine can only be almost right is that conversion typically destroys the temporal/causal dependencies signaled by the original version:

(7) a. We will celebrate only if John wins the race.
    b. If we (will) celebrate, John wins the race.

We get a disturbingly different meaning if we put (7a) in the converse form as in (7b). The latter seems to suggest quite bizarrely that the celebration precedes and brings about John's victory. Something is wrong. McCawley (1993) presents a lot of similar examples that make the traditional doctrine look thoroughly ridiculous.[3]

Note, though, that the traditional idea does have a plausible core. Intuitively, (7) asserts that John's winning the race is the only condition under which we will celebrate. This should entitle the listener to conclude that if she finds us celebrating, John must have won the race. That is (7a) should entail something like:

(8) If we celebrate, John must have won the race.

Note that (8), unlike (7b), maintains the temporal/causal dependencies carried by (7a). So, the traditional doctrine, suitably refined, seems to have an ounce of truth to it.

In the case of the claim that *only* as in (1a) is the converse of *all*, it is just as easy to come up with such counter-examples, although McCawley does not present any. As soon as we provide temporal material, we find analogues to the example in (7):

(9) a. Only runners who win races celebrate.
b. All people who celebrate are runners who win races.

These are not equivalent. So here, too, we will at least have to rethink the traditional doctrine.

Here is how we will proceed. In section 2, Option (ii) is considered and rejected (albeit perhaps not decisively). To explore Option (i), we first need to say something about the meaning of *only* when it is analyzed as applying to a proposition. This is done in section 3. Then we need a sketch of the basic analysis of sentences with bare plurals and bare conditionals. This is provided in section 4. In the following three sections, three possibilities for the interpretation of the prejacent structures are considered. While I do end up endorsing most strongly the solution discussed in section 7, the main purpose of this paper is to lay out the intricacies of the analysis of our target sentences. One might have thought that this is not much more than a simple homework assignment for a graduate course in natural language semantics. Instead, we get quickly entangled in a thicket of issues, including most prominently the semantics of lawlike statements in natural language. I hope that other researchers will venture into this terrain and make sense of these issues.[4]

2 *ONLY* IS NOT AN ORDINARY QUANTIFIER

In this section, I will reject Option (ii), which maintains that *only* is a quantificational element that relates two constituents of the prejacent structure. For (1a), the claim would be the that *only* is a determiner relating the common noun predicate (*mammals*) and the verb phrase predicate (*give live birth*). For (1b), the claim would be that *only* is an operator with the *if*-clause (*if the Queen is home*) and the main clause (*the flag flies*) as its two arguments.

2.1 'Only' *as a determiner?*

Recall the pair:

(10) a. Only mammals give live birth.
b. All animals that give live birth are mammals.

Since it seems that *only* and *all* are intimately related by being mutually convertible, why not just take the usual semantics for *all* and turn it around? Let us assume a simple analysis of *all* where it denotes the subset relation between its two argument sets, the common noun set and the predicate set:

(11) $[\![\text{all}]\!](A)(B)$ iff $A \subseteq B$, for any two sets of individuals A and B.

We might then say that *only* is a determiner that denotes the converse of *all*.[5]

(12) $[\![\text{only}]\!](A)(B)$ iff $B \subseteq A$, for any two sets of individuals A and B.

The analysis in (12) would be faithful to logical tradition. There are, however, a number of considerations that speak against this determiner analysis.[6] First, when there is an *only*-NP in object position, we can construct apparently synonymous examples with *only* as a VP-operator:

(13) a. I like only $[\text{FRENCH}]_F$ movies.
b. I only like $[\text{FRENCH}]_F$ movies.

Now, even if we adopt the determiner analysis, we have to give an account of how the meaning of (13b) comes about compositionally. But there we seem to be forced to treat the bare plural as a full NP, since it by itself fills the object position. Then it would be unparsimonious not to use a parallel analysis in the case of (13a) as well.

One way out for the determiner analysis is to claim that (13b) is actually syntactically derived from (13a) by some kind of 'shallow' placement rule. Something like such an operation is called '*only*-separation' by McCawley (1988: section 18, 611–18). It is also considered favorably by Hajicova and Sgall (Partee, Hajicova, & Sgall 1994). I find it dubious at best that there should be such a rule. It would have to be an accident that it only arises with the 'determiner' *only* and not with other determiners. For example:

(14) a. I like both books on the table.
b. *I both like books on the table.
c. The books on the table are both expensive.

Note that (14c) shows that *both* is an item that can in fact float off its noun phrase. Nevertheless, (14b) is hopeless. The positional freedom of *only* is much better explained by treating it as an adverb, not as a determiner.[7]

Secondly, we can see that (10a) is roughly synonymous with examples more clearly involving full NPs under *only*:

(15) Only mammals give live birth.
Only a mammal gives live birth.

Only the mammal gives live birth.
Only the mammals give live birth.

We would need to solve the problems brought up by these examples anyway. Here, *only* obviously attaches to an NP and therefore cannot be a determiner. Again, the determiner analysis would be too specialized to cover all examples that share the basic semantics of (10a).

A third problem with the determiner analysis is that the putative determiner *only* as defined in (12) would be non-conservative, in violation of a dearly held semantic universal which states that all natural language determiners are conservative (Barwise & Cooper 1981; Keenan & Stavi 1986; Westerståhl 1989). Recall the definition of conservativity:

(16) A determiner δ is <u>conservative</u> iff for any two sets of individuals A and B: $[\![\delta]\!](A)(B) \Leftrightarrow [\![\delta]\!](A)(A \cap B)$.

This equivalence clearly holds for run-of-the-mill determiners:

(17) Every man smokes ⇔ every man is a man who smokes.
Some man smokes ⇔ some man is a man who smokes.
No man smokes ⇔ no man is a man who smokes.
Most men smoke ⇔ most men are men who smoke.
Few men smoke ⇔ few men are men who smoke.
Many men smoke ⇔ many men are men who smoke.

But it does not hold for *only*:

(18) Only men smoke ⇎ only men are men who smoke.

The second sentence is trivially true. In set-theoretic terms, it says that the men who smoke are a subset of the men. But, for any two sets A, B, it always holds that $A \cap B \subseteq A$. From this, it does not follow that $A \subseteq B$ as claimed in the first sentence. So, *only* is not conservative.

One could argue that non-conservativity is a property that *only* shares with some uses of weak determiners discussed by Westerståhl (1985) and more recently Herburger (1993, 1997):[8]

(19) Few [inCOMpetent]$_F$ cooks applied.

The observations is that (19) can be read as saying that a small proportion of the cooks that applied are incompetent. Under this reading, the restriction of the quantifier is not given by its surface argument, but somehow computed by using the focus structure of the sentence. Friends of the determiner analysis could then say that *only* works exactly the same way and that both weak determiners and *only* contrast with strong determiners in this respect:

(20) a. Only [inCOMpetent]$_F$ cooks applied.
b. Most [inCOMpetent]$_F$ cooks applied.

While the focus in (20b) is most naturally interpreted as contrastive on a discourse level, the focus in (20a) crucially affects the proposition expressed. What is claimed in (20a) is that the set of cooks who applied is a subset of the set of incompetent cooks.[9] But going against the parallel between weak determiners and *only*, we have the following contrast:

(21) a. Few incompetent cooks [apPLIED]$_F$.
b. #Only incompetent cooks [apPLIED]$_F$.

The determiner *only* would still be special in that it demands that the focus be somewhere in its syntactic argument. But anyway, in the absence of an analysis that salvages conservativity in the face of examples like (19), the conservativity argument cannot be taken as a severe problem for the determiner analysis.[10]

What is the upshot of this discussion? Clearly, 'whatever *only* is categorized as, it's an oddball, and its oddity has to be localized somewhere' (Jim McCawley, p.c.). Much of our analysis has to be tailored to this one particular item. So, saying that in one of its senses *only* is a determiner with a number of very peculiar properties is not in any sense crazy.[11] Nevertheless, if a general analysis of *only* as an adverb were available that could be naturally applied to the cases where *only* seems to be a determiner, we would prefer such a uniform analysis. The idea, floating in the folklore, is that noun phrases like *only mammals* should be analyzed as cases where *only* is modifying a bare plural noun phrase. That is, *only* doesn't make a noun phrase out of a common noun, but modifies a constituent that is already a noun phrase in its own right.

2.2 'Only' *as an adverb of quantification?*

My somewhat tentative rejection of the determiner analysis gets re-enforced as soon as we turn to *only if*. First of all, it would be unparsimonious to introduce a special analysis for the collocation of *only* with *if*, given that we need an analysis of synonymous cases where the two items occur at a distance:

(22) a. We will play soccer only if the sun is shining.
b. We will only play soccer if the sun is shining.

Of course, one might claim that *only* ... *if* is a discontinuous item, but that should be a last resort.

One obvious idea would relate *only* to the adverb of quantification *always*, inspired by the near paraphrase relation illustrated here:

(23) a. We only play soccer if the sun is shining.
b. If we play soccer the sun is always shining.

The paraphrase relation is not entirely convincing, of course, for reasons we mentioned early on: (23b), but not (23a), carries a suggestion that our playing soccer somehow makes the sun shine. But let's assume that we can clean up the analysis enough to get rid of that problem. An account of (23b) that we might want to base our analysis on comes from Lewis (1975). The adverb *always* quantifies over 'cases': it says that <u>all</u> the cases specified by the *if*-clause are cases in which the consequent is true. The role of the *if*-clause is to restrict the adverb of quantification, there is no other meaning to *if*. Kratzer (1978, 1986) has proposed to generalize this analysis to all conditional structures: *if*-clauses in general are used to restrict quantifiers of various sorts. We could now attempt a move parallel to the determiner analysis of *only* considered in the previous subsection. Why not say that *only* in (23a) is an adverb of quantification that denotes the converse of the adverb *always*:

(24) $[\![$always (if p) (q)$]\!]$ iff all p-cases are q-cases.
$[\![$only (if p) (q)$]\!]$ iff all q-cases are p-cases.

Again, one of the problems with this analysis would come from the non-conservativity of the putative adverb of quantification *only*. Work on adverbial quantification has shown that conservativity holds for adverbs of quantification as well as for determiners (Schwarzschild 1989; de Swart 1991). So we would have to give up or modify this result as well.

A more serious problem comes from the fact that *only if*-sentences come in a variety of flavors:

(25) a. We only play soccer if the sun is shining.
b. John will only be arrested if there is evidence against him.
c. John would only have been arrested if there had been evidence against him.

The examples in (25b and c) are what are sometimes called on-case conditionals: they are about a specific event not about a set of cases. (25b) is an indicative conditionals, (25c) is a counterfactual conditional. Now, these kinds of readings <u>never</u> arise with adverbs of quantification: there are no one-case conditionals involving *always*, *often*, *never*. The proper conclusion is that in these examples *only* combines with a conditional sentence that has a semantics of its own: *only* is not the only logical operator in these sentences.

2.3 Moving on

For *only if*-constructions, then, it is clear that we need an analysis where *only* semantically combines with a prejacent proposition (a conditional structure with its own operator). Since we want to maintain a certain amount of uniformity between the two kinds of constructions we are concerned with, this also motivates us to look beyond the determiner analysis of *only* for examples like *only mammals give live birth.*

We would prefer an analysis of the structures in (1) that does not introduce new meanings for *only*. We want to treat the combination of *only* with bare plurals and with bare conditionals in a compositional manner. The analyses should respect independently motivated accounts of *only*, bare plurals, and bare conditionals. Early attempts at analyzing *only if* into *only* and *if* can be found in Geis (1973) and McCawley (1974); see also McCawley (1993). Recent work includes Lycan (1991), Barker (1993), and Appiah (1993). I do not know of any explicit attempts at treating the combination of *only* with bare plurals, other than the determiner analysis.

The severity of our problem can perhaps best be appreciated by looking at Geis's attempt (which is adopted in Lycan's work) and McCawley's response in his 1974 squib. According to Geis/Lycan, *if p, q* means 'all p-cases are q-cases'. Sometimes the universal force of this analysis is disguised by using a bare plural paraphrase 'p-cases are q-cases'. Now, attach *only*: 'only all p-cases are q-cases'. Clearly that is not the right meaning for *only if p, q*. One can disguise the failure of the analysis by using the bare plural paraphrase 'only p-cases are q-cases', in which the universal force has mysteriously disappeared. In fact, now we might even want to give the paraphrase 'only some p-cases are q-cases' (with focus on 'p'), where we have existential force. This kind of analysis cannot be called compositional: we are merely given paraphrases for the two ingredients where one of the paraphrases gets different readings depending on whether it stands on its own or is combined with the other paraphrase. In McCawley's squib, he clearly shows that the Geis/Lycan analysis doesn't work compositionally. He finally despairs of finding a compositional analysis of *only if*. His last sentence is 'Have I missed an alternative?'

Let's try. First, we need a semantics for *only*. Then, we will need to figure out what the semantics of the prejacent construction is. We will end up with the same problem we just saw: the prejacent is naturally analyzed as involving universal quantification, but once *only* is attached it's as if the prejacent is now existentially quantified. How can that be? I will consider three solutions: (i) the prejacent is in fact existentially quantified and the fact that without *only* it is read as universally quantified is due to some extraneous factor; (ii) the prejacent is universally quantified, but its focus structure is such that when it is combined with *only* we automatically get the meaning we want; (iii) the prejacent is universally quantified, but the implicit quantifiers involved crucially validate the Law of the Excluded Middle and the Law of Contraposition, which together derive the correct meanings for our sentences. I will argue that the third solution is most generally applicable, while special cases may be analyzable along the lines of the other two proposals. We will thus end up having used the analysis of the sentences in (1) as a probe into the semantics of implicit quantification in conditionals and generics.

3 THE SEMANTICS OF *ONLY*

We have decided to pursue the idea that *only* modifies a prejacent proposition. What goes on in such structures? And how do structures work where *only* doesn't appear to be attaching to a proposition?

3.1 'Only' *as a propositional operator*

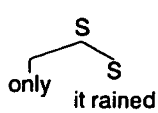
It is easily seen that *only* is an item that can attach to constituents of a wide variety of syntactic categories, a property it shares with some other 'logical' operators like negation and conjunction. Here's an illustration:

(26) a. [Only John] was awake in time for breakfast.
 b. John [only voted by proxy].
 c. John invited [only a couple of old friends].
 d. John watches TV [only during dinner].
 e. John solved the problem [only after Mary gave him a tip].

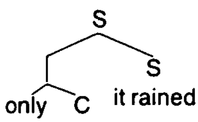
The best-known among the serious semantic analyses of *only* is probably the one found in Mats Rooth's dissertation (1985).[12] Rooth's idea is that the various manifestations of *only* can be reduced to a base case where *only* combines with a proposition and asserts that no other proposition is true. Here's as good an example of *only* applying to a propositional argument as one finds (from Irene Heim, class discussion):[13]

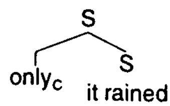
(27) The barbecue went fairly well. It only rained. It wasn't windy, there are enough beer, and there weren't any mosquitoes.

Imagine that the logical form of *it only rained* is this:

(28)


The claim is that (28) is interpreted as saying that no proposition other than the one that it rained is true. But clearly, what (28) says cannot literally be as sweeping as that; there will always be numerous other true propositions beside the one that it rained. The negative quantification has to range over a restricted domain of propositions, here apparently propositions about the occurrence of annoying circumstances. None of those propositions other than the one that it rained is true. The restricted set of propositions quantified over are called the 'alternatives' by Rooth (1985) and the 'neighbors' by Bennett (1982). This context-dependent nature of *only* is a property it shares with all other quantificational constructions in natural language. What we will do is assume that, at logical form, *only* is provided with an implicit argument of the type of sets of propositions. That is, the logical form of our sentence is really this:[14]

(29) 

or as we will write from now on: 

Putting C into the logical form is just a matter of convenience and not the only possible way of dealing with the context-dependency of quantifiers. Various issues having to do with contextual restrictions on quantifiers are discussed in von Fintel (1994: section 2.2), where further references are given. The semantic value of *only* is a function that takes a set of propositions C and a prejacent proposition p and asserts that no proposition in C other than p is true. The basic intuition here is that *only* is a funny kind of general negation, it denies all the (contextually relevant) alternatives to its sister proposition:

(30a) For all sets of propositions C, propositions p, r, and worlds w:
$[\![\text{only}]\!](C)(p)$ is true in w iff $\forall r \in C$ ($r \neq p \rightarrow r$ is false in w)
<u>or (equivalently)</u> iff $\forall r \in C$ (r is true in w $\rightarrow r = p$).

In addition to the negative claim about alternatives to rain, it seems that (27) also conveys that the prejacent is true, that it actually rained. Is that part of the truth-conditions, i.e. is the prejacent entailed? Or is it presupposed, or is it merely implicated? There is a major industry devoted to this question (Horn 1992, 1996; Atlas 1993). I will assume for concreteness that we are dealing with a presupposition.

Horn (1990) argues that we actually don't want to say directly that the truth of the prejacent is presupposed. Rather, he effectively suggests that what is presupposed is that there is at least one alternative in C that is true. Taken together with the assertion that no proposition in C other than p is true, we will be able to infer that p is true. The difference between the two options will only show up when we embed the *only*-proposition in various matrix contexts. Horn argues that the weaker presupposition is more adequate; we will not review the discussion here. Here is how we could formalize the Horn-presupposition in our framework:

(30b) For all sets of propositions C, propositions p, r, and worlds w:
$[\![\text{only}]\!](C)(p)$ is defined for w only if $\exists r \in C$: r is true in w.
If defined, $[\![\text{only}]\!](C)(p)$ is true in w iff
$\forall r \in C$ (r is true in w $\rightarrow$ r = p).

Horn himself tries to derive this presupposition by appealing to the well-known existential import of *all* in natural language.[15] Since *all As are Bs* arguably presupposes that there are As, we have that its converted equivalent *only Bs are As* presupposes that there are As as well. And, if there are As and we assert that nothing other than Bs are As, we can infer that (some of) the Bs are in fact As. In this paper, however, we cannot go this way: after all, we cannot directly say that *only* is the converse of *all*, which would only work under the determiner analysis which we rejected. Our project is to derive convertibility while not treating *only* as a determiner.

How do we find out what the set of contextually relevant alternatives C is in any given case, a daunting task since this set is only implicitly given? We need to read the speaker's mind[16] and one way of doing that is by looking at the focus structure of the argument of *only*. Here's an example (again from Irene Heim):

(31) It only rained in $[\text{MEDford}]_F$.

Quite clearly, the only propositions whose falsity is asserted here are propositions that talk about rain in places other than Medford. Propositions about John's reading *War and Peace* are irrelevant. This phenomenon has become known as 'association-with-focus'. We subscribe to Rooth's 'alternative semantics' for focus. The principal effect of focus is to introduce into the context a set of alternatives to the focused item. This can then be passed on 'up the tree' and lead to sets of alternatives for bigger expressions. The focus on *Medford* in (31) first evokes a set of relevant contrasts to Medford. Higher up what we get are alternative propositions about rain in the places contrasting with Medford. In a sentence with *only*, we can look at the focus structure as providing us with information about the set of propositions among which *only* is roaming semantically. How exactly these evoked alternatives come to enter into the interpretation of sentences with *only* need not concern us here.[17] Let us just put things this way:

(30c) For all sets of propositions C, propositions p, r, and worlds w:
⟦only⟧(C)(p) is defined for w only if (i) $\exists r \in C$: r is true in w,
(ii) the focus structure of p constrains the extent of C.[18]
If defined, ⟦only⟧(C)(p) is true in w iff $\forall r \in C$ (r is true in w $\rightarrow$ r = p).

There is another problem with the strong assertion of *only* as formalized in (30c): if it rained in Medford, then there are presumably quite a lot of further propositions that have to be true, all the logical entailments of the proposition that it rained in Medford. For example, if it rained in Medford, then there must have been some drops of water falling on some part of Medford (note that this is a unilateral entailment). Such true propositions do not threaten the assertion made by *only*. There are two ways we could get rid of this problem: we could change the entry for *only* so that it says that all true propositions have to be merely entailed by the prejacent proposition instead of being identical to it:

(30d) For all sets of propositions C, propositions p, r and worlds w:
⟦only⟧(C)(p) is defined for w only if (i) $\exists r \in C$: r is true in w,
(ii) the focus structure of p constrains the extent of C.
If defined, ⟦only⟧(C)(p) is true in w iff $\forall r \in C$ (r is true in w $\rightarrow$ p $\subseteq$ r).

Alternatively, we could let the contextual restriction do the work, by requiring that these propositions just aren't legitimate alternatives:

(30e) For all sets of propositions C, propositions p, r, and worlds w:
⟦only⟧(C)(p) is defined for w only if (i) $\exists r \in C$: r is true in w,
(ii) the focus structure of p constrains the extent of C,
(iii) no proposition in C is entailed by p.
If defined, ⟦only⟧(C)(p) is true in w iff $\forall r \in C$ (r is true in w $\rightarrow$ r = p).

I will choose the latter approach for concreteness.

A further modification: when it rained in Medford last week, some raindrops fell on the mayor's house. Now, it is not logically necessary that rain in Medford will drop on the mayor's house; nevertheless it just happened to be part of that particular rain episode. So, there is a proposition that is true, which is different from and not entailed by our prejacent proposition. This problem was noted by Kratzer (1989), who cited the following dialogue with a lunatic:[19]

(32) Lunatic: What did you do yesterday evening?
Paula: The only thing I did yesterday evening was paint this still life over there.
Lunatic: This is not true. You also painted these apples and you also painted these bananas. Hence painting this still life was not the only thing you did yesterday evening.

Kratzer proposes to thwart the lunatic by saying that the proposition *I painted this still life* lumps the proposition *I painted these apples*, and that propositions that are lumped by a target proposition are not legitimate alternatives to that proposition. A proposition p lumps a proposition q in a world w iff in every situation s in w in which p is true, q is true as well. To execute this, we have to move to a situation semantics. What we have then is this:[20]

(30f) For all sets of propositions C, propositions p, r, and worlds w:
$[\![\text{only}]\!](C)(p)$ is defined for w only if (i) $\exists r \in C$: r is true in w,
(ii) the focus structure of p constrains the extent of C,
(iii) no proposition in C is entailed by p,
(iv) no proposition in C is lumped by p.
If defined, $[\![\text{only}]\!](C)(p)$ is true in w iff $\forall r \in C$ (r is true in w $\rightarrow$ r = p).

For the moment, I will leave things at that.[21]

3.2 'Only' *combining with non-propositional constituents*

Convincing cases where *only* is plausible modifying a proposition, such as Heim's examples in (27) and (31) and also McCawley's (1970) example in footnote 13, are not easy to find. Perhaps the most common position for *only* is in the auxiliary system (around Infl). It then typically associates with a focus somewhere in the VP. This kind of behavior, somewhat troublesome from the point of view of the claim that *only* is a propositional operator, is also shared by natural language negation, which doesn't naturally occur in sentence-peripheral position. Here are a couple of possible responses. In accordance with the predicate-internal subject hypothesis in recent GB syntax (or its analogues in other frameworks), we could maintain that VP-level *only* is in fact attached to a propositional constituent. What happens is just that for extraneous reasons the subject has to raise out of the predicate phrase (either for case reasons or to satisfy the Extended Projection Principle).

The other option, the one pursued by Rooth (1985), is to reduce the semantics of VP-level *only* to that of the proposition-level *only*. Here's an example:

(33) [What did Kim do last night?] Kim only_C [watched *The X-Files*]$_F$.

The straightforward way to treat (33) would be to say that there is a VP-operator *only*^{VP} that says that among a certain set of properties C none other than its sister VP truthfully applies to the subject. The set of alternative properties C in (33) presumably contains properties like 'went to the opera', 'read *War and Peace*', 'cooked a five course dinner', 'prepared her tax return', and so on. The sentence claims that those properties in C that are not the property 'watched *The X-Files*' do not truthfully apply to Kim.

But Rooth's project was to reduce such non-propositional uses of *only* to the basic case of *only* operating on propositions. It is in fact easy to translate our talk above about properties into talk about propositions: the set of alternative propositions includes 'Kim went to the opera', 'Kim read *War and Peace*', 'Kim cooked a five course dinner', 'Kim prepared her tax return', and so on. The sentence claims that those propositions in C that are not the proposition 'Kim watched *The X-Files*' are false.

To reduce the verb phrase-level *only* in (33) to a proposition-level *only*, Rooth (1985) takes a cross-categorial approach, where a family of meanings for *only* is defined, a different meaning for each syntactic environment. These meanings are related by a general type-shifting schema. What we do is posit an operator *only*^{VP}, which is systematically related to the propositional operator *only*^{S}. The semantics of this new operator takes a set of properties C and a property P and gives a function that for any individual x gives us the same proposition as the propositional *only*^{S} would give us for the set of propositions that we get from applying all the properties in C to x and the proposition resulting from applying P to x. In symbols:

(34) For all sets of properties C, for all properties P, all individuals x, all worlds w
$[\![\text{only}^{VP}]\!](C)(P)(x)$ is true in w iff $[\![\text{only}^{S}]\!](\{Q(x): C(Q)\})(P(x))$ is true in w.

In general, we can find a reducible meaning for *only* whenever it combines with an expression that is a function that given the right arguments will give a proposition. For more in-depth discussion, see Rooth (1985) and Krifka (1991). Three consequences of this view are particularly interesting in the context of this paper: (i) the putative determiner *only* would have a meaning that is not reducible to the propositional base-case; (ii) even for the seemingly simple case of *Only John left*, we will need a rather complicated analysis; *John* here will have to be treated as a generalized quantifier to which *only* applies—more on this in Appendix B; (iii) unless very complex types are introduced, the prediction is that *only* takes scope over its local proposition.

Instead of Rooth's cross-categorial semantics for *only*, one could pursue an LF-based approach, where *only* moves covertly to adjoin to a propositional constituent (if it isn't already adjoined to one).[22] To mimic the strict locality of the scope of *only*, mentioned under (iii) above, one might limit this scopal movement to the local clause. Scopal movement of *only* would not be the same as the focus-movement that Rooth argues against, where the focused constituent associated with *only* raises to a position next to *only*. An LF-approach to *only* could be combined with a Roothian *in situ* approach to focus semantics. But I will not attempt seriously to pursue such an account here. Nevertheless, using the cross-categorial semantics for *only* quickly gets somewhat intricate, and so I will tend to use (pseudo-) logical forms at various points where I pretend that we are dealing with the propositional operator *only*. But for current purposes, this should clearly be seen as merely an expository device; I do not want to adopt seriously an LF-approach.

3.3 *Where we are now*

Let us turn to the main problem we want to explore in this paper:

(1) a. Only mammals give live birth.
    b. The flag flies only if the Queen is home.

Strictly speaking, we will have to work on analyses that involve the cross-categorial operator *only* combining with a bare plural noun phrase in (1a) and with a verb phrase containing an *if*-clause in (1b). As mentioned, I will instead pretend that we are dealing with logical forms in which *only* attaches to the whole prejacent sentence:

(35) a. only_C [mammals give live birth]
     b. only_C [the flag flies if the Queen is home]

Our task is now to figure out what the semantics of the prejacent is and what the relevant alternatives in C are like. Wrong choices will lead to wrong meanings. The analysis of section 5 assumes an existentially quantified prejacent. The analysis in section 6 assumes a quasi-universal prejacent with wide focus on the quantifier restriction. The analysis of section 7 assumes a quasi-universal prejacent with potentially narrow focus inside the quantifier restriction, which makes it necessary to attribute certain interesting logical properties to bare conditionals and bare plurals.

But first we will briefly have to discuss the interpretation of sentences with bare plurals and bare conditionals. This will be woefully sketchy but that's unavoidable.

4 IMPLICITLY QUANTIFIED STRUCTURES

Sentences with bare plurals in them of course sometimes have existential force and sometimes have universal/generic force. This 'quantificational variability' is an effect that has been at the center of much work in contemporary semantics. There are two main approaches: (i) bare plurals are names of kinds and the quantificational force of the sentences they appear in comes from the predicate; (ii) bare plurals are indefinites and the quantificational force comes from overt or covert operators.[23] I will have some comments on the reference to kinds approach later on. For the moment, I will assume the indefinites approach. This approach has two variants: the unselective binding account and the event/situation-based account. Although I have strong sympathies for the latter (von Fintel 1997b), I will here work within the unselective binding account, mainly for reasons of convenience.

In this account, bare plurals are interpreted as predicates that are either conjoined with the other predicates in the structure or serve as the restriction of some operator. In structures where no overt operator is available to take care of the predicate, two covert procedures can apply. Either a default process of Existential Closure kicks in or an implicit quasi-universal quantifier is introduced. A few samples:

(36) a. I made cookies last night.
$\exists\,[\lambda x\ \text{cookies}(x)\ \&\ \lambda x\ \text{I-made-last night}(x)]$
b. Professors are usually confident.
usually $[\lambda x\ \text{professor}(x)][\lambda x\ \text{confident}(x)]$
c. Professors are confident.
$\textsc{gen}\ [\lambda x\ \text{professor}(x)][\lambda x\ \text{confident}(x)]$

In (36a), Existential Closure turns the complex predicate consisting of the bare plural *cookies* and the rest of the sentence into an existentially quantified statement. In (36b), the adverbial quantifier *usually* quantifies over individuals that satisfy the bare plural predicate. To analyze (36c), we posit an implicit quantifier, called GEN to remind us of 'generic'.

The factors that determine which procedure applies in a given case are multifarious and the object of intense study in recent work. In the absence of overt operators, bare plurals are preferentially read existentially when they are VP-internal in various senses. One of the more solid generalizations is that bare plural subjects of 'individual-level' predicates (such as *confident*) are forced to be read generically. This fact that will play a central role in the next section.

In conditionals, implicit quantifiers are at work as well (Kratzer 1978, 1986). Consider:

(37) a. We always play soccer if the sun is shining.
always [λs the-sun-is-shining (s)][λs we-play-soccer (s)]
b. We play soccer if the sun is shining.
GEN [λs the-sun-is-shining (s)][λs we-play-soccer (s)]

While in (37a) the overt adverbial quantifier *always* relates the restrictive *if*-clause with the matrix clause, this is achieved by an implicit operator in (37b). One thing to note is that there do not seem to be cases where bare conditionals are read as having existential force: for some reason, the process of Existential Closure seems inapplicable to conditional structures.

I will assume that the very same implicit operator is at work in generic sentences and conditional sentences. This rather adventurous assumption is discussed with considerable sympathy by Krifka *et al.* (1995: 49–57). I will not argue for it here. If it turns out to be mistaken, the account developed here would not suffer much; we would just have to separate more carefully the bare plural cases from the bare conditional cases. The fact that GEN gives rise both to generic sentences and conditional sentences could be explained by treating it as an unselective quantifier.

We need to keep in mind that the quantificational force of GEN is not strictly speaking universal. Both generic sentences and conditional sentences—let us call them lawlike sentences with an umbrella term—notoriously allow exceptions. One way of accounting for that is by assuming that GEN only quantifies over 'normal' or 'relevant' cases.[24] Consider:

(38) a. Professors are confident.
'All normal/relevant professors are confident'
b. We play soccer if the sun is shining.
'All normal/relevant situations in which the sun is shining are situations in which we play soccer'

The function of the adjectives *normal* or *relevant* in these paraphrases can be formally captured by a selection function which from the domain of quantification supplied by the bare plural or the bare *if*-clause selects a set of cases about which GEN then makes a universal claim.[25] I will assume for convenience that at logical form there is a variable over selection functions associated with GEN. The lexical entry for GEN will look like this:

(39) For σ either e or s, for all p, q $\in D_{\langle\sigma,t\rangle}$, f $\in D_{\langle s,\langle\sigma t,\sigma t\rangle\rangle}$, and worlds w: $[\![\text{GEN}]\!](f)(p)(q)$ is defined for w only if $\exists x \in f(w)(p)$.
Where defined, $[\![\text{GEN}]\!](f)(p)(q)$ is true in w iff $\forall x \in f(w)(p)$: q(x).

This definition is schematic in that it is supposed to cover both the use of GEN as a quantifier over individuals (in which case the type σ will be e) and the use of GEN as a quantifier over worlds/situations (in which case σ will be the type s). The selection function f differs potentially with the evaluation world. It will select a set of relevant individuals or worlds/situations from the domain of quantification *p*. There is an existence presupposition: that the selection function will select a non-empty set of relevant cases. About the set of relevant cases, GEN then makes a universal claim: all of them are *q*-cases.

One might want to speculate what factors determine whether a generic sentences or a bare conditional sentence is chosen. Clearly it would be awkward to replace *Mammals give live birth* with *If something is a mammal, it gives live birth.* Similarly, *The flag flies if the Queen is home* is preferable to *Occasions on which the Queen is home are occasions on which the flag flies.* Nevertheless, since in all of these GEN is at work, the pairs seem roughly equivalent.

To fill out this sketch, which is not something we can do here, we will have to say much more about the nature of quantification over 'normal' or 'relevant' cases and much more about the covert processes of Existential Closure and the licensing of GEN. I hope that what I have said here will be enough to let us go on in our investigation. For details, I have to refer to the large literature on bare plurals, indefinites, adverbs of quantification, genericity, conditionals, and so on.

5 EXISTENTIAL PREJACENTS?

It would be easy to get the right meanings if we could convince ourselves that the prejacents modified by *only* in our target examples invariably had existential force. In this section, I consider this possibility. In the end, I will say that some examples do actually have this property, but others probably don't, so at least for those we will need a different account.

5.1 *How existential prejacents interact with* 'only'

Take some existentially quantified propositions:

(40) a. Some professors are confident.
b. Sometimes, if the sun is shining, we play soccer.

The interpretation of (40a) is unproblematic. The interpretation of (40b), in accordance with the Lewis–Kratzer thesis, is something like: some situations/cases in which the sun is shining are situations/cases in which we play soccer.

Now, add *only* to these propositions and associate it with focus on the restriction of the existential quantifier:

(41) a. Only [some [proFESsors]$_F$] are confident.
b. Only [if [the SUN shines]$_F$ do we sometimes play soccer].[26]

The interpretation of these examples is straightforward, based on our previous discussion. What happens in (41a) is that *only* denies all relevant alternative propositions of the form 'some Xs are confident'. What is denied is that some students are confident, some administrators are confident, etc. Take all the individuals that at least one of the alternatives to 'professor' is true of. The truth-conditions of (41a) then amount to the claim that among all those individuals the only ones that are confident are professors. Whether there is any commitment to the claim that there are in fact such individuals depends on the status of the Horn-ingredient. If we say that the truth of the prejacent is presupposed, then it is presupposed that some professors are confident and it is denied that anyone else is confident. Note that in this way, the assertion of (41a) amounts to the claim that everyone (in the relevant domain) who is confident is a professor. In effect, (41a) is the converse of *All confident people are professors*. We can now see that we would get close to salvaging the convertibility doctrine for the target sentence *Only professors are confident*, if we could argue that it contains an existentially quantified prejacent.

For (41b), matters are essentially parallel, except that there we are dealing with quantification over situations or cases. *Only* denies all alternatives of the form 'we sometimes play soccer if X', where we consider alternative weather conditions X. That results in the claim that any situation in which we play soccer has to be one in which the sun is shining. In effect, (41b) will be the converse of *If we play soccer the sun must be shining*.[27]

5.2 *Do we have existential prejacents in our examples?*

Consider then:

(42) a. Only [proFESsors]$_F$ are confident.
b. We play soccer only if [the SUN shines]$_F$.

Can we reasonably assume that *only* here applies to an existentially quantified prejacent proposition? I will argue that we can make this assumption in some cases but not in all of them.

5.2.1 Bare plural prejacents

When we look at bare plurals that naturally get an existential reading, we can safely assume that when such structures are embedded under *only* we will have no difficulty in getting the right interpretation:

(43) a. I made cookies last night.
 b. I only made [COOkies]$_F$ last night.

The example in (43a) is one where it is unproblematic to assume that Existential Closure applies to give *cookies* existential force: there are some cookies that I made last night. When *only* is added, as in (43b), alternatives to that existential claim are denied: it is false that there are some cakes or ice-cream sundaes that I made last night.

Things get more difficult when we turn to cases where bare plurals occur in a context where they normally cannot get an existential reading:

(44) Professors are confident.

One of the well-known results of the research on bare plurals cited earlier is that bare plural subjects of individual-level predicates like *be confident* are reliably read as being universally/generically quantified. (44) means that professors in general are confident, not merely that some professors are confident. In isolation, then, the putative prejacent proposition of the sentence *Only professors are confident* does not have an existential reading.

How should we react to this situation? There are three possible reactions. First, we could take this to be a demonstration that we should not assume that our target sentences involve prejacent propositions, i.e. we could abandon Option (i) and return to Option (ii). But since we had reasons to be wary of Option (ii), let's not give up just yet. Second, we could try to heroically maintain that while (44) by itself does not have an existential reading, when this structure is embedded under *only* something somehow licenses Existential Closure. Third, we could take the observation at face-value: the prejacent is a generally quantified proposition, and we'll have to find some way of getting the right interpretation for when *only* gets added to it.

In the rest of this section, I will go through some evidence that may help us decide the matter. There is one argument for existential prejacents (other than the fact that it would make the interpretation of our target sentences straightforward). And there is one argument for generic prejacents in at least some cases (other than the fact that it might be hard to come up with a story of how existential force comes to be more widely available under *only*). I do not want to reject once and for all the possibility that we have existential prejacents throughout; but I do have a neat account which gets us the right interpretations even in the case of generic prejacents. So I will try to convince myself and the reader that it is worth considering that account.

5.2.2 Maybe we do have an existential prejacent

The best argument for an existential prejacent even in apparently recalcitrant cases such as *only professors are confident* comes from thinking about the Horn-ingredient of the meaning of *only*. Remember that we might want to claim that the truth of the prejacent proposition is presupposed or implicated. Consider the following examples:

(45) a. Only $[\text{proFESsors}]_F$ are confident.
b. Only $[\text{DEmocrats}]_F$ supported Clinton. from Horn (1996)
c. Only $[\text{inTELligent people}]_F$ are physicists. from Barker (1993)
d. Only $[\text{WOmen}]_F$ have blue eyes. from Kiss (1994)

It is obvious that speakers who utter these sentences do not have to presuppose that professors in general are confident, that all democrats supported Clinton, that all intelligent people are physicists, and that all women have blue eyes.[28] So, <u>if</u> what we feel these sentences as signaling about the speaker's presupposition is a straightforward clue as to what the prejacent proposition is, we have to conclude that we are dealing with existentially quantified prejacents. And that would be so even though the putative prejacents uttered on their own are not readily understood existentially.

Let me also consider one *only if*-example where the presupposition seems to be less than universal:

(46) George is a cat only if he is a mammal.

Barker (1993) thinks that this does not presuppose that if George is a mammal he is a cat. He must have a reading in mind where (46) means the same as (47):

(47) George can be a cat only if he is a mammal.
(Otherwise, he must be something else).

Then (46) may actually involve an existential prejacent, as made explicit by *can* in (47). The presupposition of (46)/(47) would be that if George is a mammal he <u>can</u> or <u>may</u> be a cat, which is harmless enough. I'm not sure however that (46) can be read that way. To my ear, it does presuppose that if George is a mammal he is a cat, absurd as that sounds at first glance. A natural context would be one where we have established that George is either a cat or a small lizard. Then, (46) and its (universal) prejacent are true.

But at least for bare plurals, the observation seems to stand: we do not reliably get strong universal presuppositions, instead the presupposition seems to have at most existential force. If this observation accurately reflects the actual interpretation of the prejacent, then we have an argument for existential prejacents.

5.2.3 Against assuming existential prejacents throughout

The best argument for generic prejacents in at least some cases involves negative polarity. Bare plural noun phrases in the scope of *only* can contain negative polarity items (NPIs):

(48) Only students who have any experience in math (manage to) master this course.

NPIs are <u>not</u> licensed in existential sentences of the relevant kind:

(49) #Some students who have any experience in math (managed to) master(ed) this course.

NPIs <u>are</u> licensed in quasi-universal sentences of the relevant kind:

(50) (All) students who have any experience in math (managed to) master this course.

Finally, attaching *only* to a clearly existential prejacent does <u>not</u> rescue NPIs:

(51) #Only sm students who have any experience in math (managed to) master(ed) this course.

As Horn (1996) observes, NPIs are only licensed in a bare plural in the scope of *only* if there is a causal/lawlike force to the prejacent:

(52) a. Only (those) students who have any siblings need to complete the survey.
b. #Only (those) students who have any siblings happen to have passed the exam.
c. Only (those) students who have ever been to Europe need to complete the survey.
d. #Only (those) students who have ever been to Europe happen to have passed the exam.

Lastly, NPIs that are licensed in *only*-bare plurals are exactly those that are licensed in generic bare plurals. So-called strong NPIs are not licensed:[29]

(53) a. #Members who have paid <u>a red cent</u> towards their bills can renew their membership.

b. #Only members who have paid a red cent towards their bills can renew their membership.

The obvious conclusion, arrived at by Irene Heim (MIT class discussion, 4/22/94), is that what licenses NPIs in the scope of *only* is the genericity present in the prejacent.[30,31]

5.2.4 The prospects for the existential prejacents account

Recently, researchers have pointed out more and more observations which suggest that bare plurals can more easily be read existentially than was assumed in much of the earlier literature. Some discussion can be found in Fernald (1994), McNally (1995), and Glasbey (1997). Consider an example from Glasbey:

(54) a. Monkeys live in trees.
b. Monkeys live in that tree.

While the bare plural subject of (54a) cannot be read generically, an existential reading surfaces (and is preferred) in (54b).

These observations suggests that existential readings can be manufactured in ways that are as yet ill understood. Perhaps then, *only* somehow helps create existential readings in configurations where they are not normally available. Consider the case of the flag over Buckingham Palace:

(55) a. They only hoist the flag if [the QUEEN is home]$_F$.
b. They hoist the flag if the Queen is home.
c. They sometimes hoist the flag if the Queen is home.

The prejacent of (55a) when read on its own as in (55b) does not have an existential reading like the overtly existential example in (55c). In fact, (55c) couldn't even be embedded under *only*:

(56) a. ?*They only sometimes hoist the flag if [the QUEEN is home]$_F$.
b. They only ever hoist the flag if [the QUEEN is home]$_F$.

Only does not easily allow an existential quantifier *sometimes* in its scope as in (56a). Instead, what is required is the negative polarity item *ever* as in (56b). Now, we could try saying that *only* somehow licenses a silent *ever*, and that bare conditionals do not allow silent *ever* because they are not in the scope of a negative polarity licenser. I invite other researchers to continue this line of argumentation. I remain skeptical.

To some extent, I would just like to stamp my foot and claim that we should not blithely assume that bare plurals can get existential force by magic when they occur under *only*. Compare:

(57) a. I like operas by Bellini.
a′. I like an opera by Bellini.
b. I only like operas by Bellini.
b′. I only like an opera by Bellini.

For some reason, a generic reading is preferred in (57a), while (57a′) seems to have only an existential reading, if it is at all felicitous. Now, if *only* were somehow to license existential prejacents, no matter whether they were felicitous in the structure without *only*, we wouldn't expect there to be a contrast between (57b) and (57b′). The addition of *only* should wipe out the difference between the prejacents. But that's not what happens. (57b) is read as having a generic prejacent: I like Bellini operas in general and no other operas. (57b′) is read as having an existential prejacent: the only opera I like is a Bellini opera.

Perhaps, a more serious version of this foot-stomping is the observation that there is no case where bare conditional sentences have existential force: they typically involve quasi-universal force or some kind of necessity. So, in distinction to bare plural sentences, which at least sometimes surface with existential force, bare conditionals never do so.

While I do have these doubts about the prospects for the existential prejacents theory, I do not pretend to have disproved it. But I wish to present a solution to our problem which works even if the prejacent is generically quantified.

5.2.5 What do with the Horn-ingredient

If I want to seriously consider the possibility that our *only*-sentences at least sometimes involve generic/universal prejacents, I need to say something about the argument in section 5.2.2 from the Horn-ingredient. How should we respond to the observation that someone who asserts the sentences in (45) is not committed to a quasi-universal claim? What is going on in examples such as (58)?

(58) Only birds have feathers and $\left\{\begin{array}{c}\text{not even all of them do} \\ \text{even among birds there are} \\ \text{some without feathers.}\end{array}\right\}$.

One possibility is that (45) and (58) somehow readily allow weakening or cancelling of the presupposition. Consider more familiar kinds of examples where the presupposition of truth of the prejacent is suspended:

(59) I love only you and even about you I have my doubts.

Horn has consistently used such examples to argue that the truth of the prejacent is not an entailment but a suspendable presupposition. Perhaps, we should read (58) in the very same way.

Another possibility is that we cannot use the Horn-ingredient as a clue about the semantics of the prejacent. Perhaps, there is no such thing as the Horn-ingredient. Perhaps, the truth of the prejacent simply isn't presupposed or entailed.

I leave the matter in this unresolved state and now propose to see whether we can arrive at a good analysis of what our target sentences mean under the assumption that the prejacent is not always existentially quantified, but at least sometimes has generic or universal force.

6 WIDE FOCUS?

Consider again the prejacents of these examples:

(60) a. Only professors are confident.
b. prejacent: Professors are confident.
c. We play soccer only if the sun shines.
d. prejacent: We play soccer if the sun shines.

We are now working with the assumption that our *only*-sentences involve the following logical structure (again short-circuiting the complications of the cross-categorial approach):

(61) a. only$_C$ [GEN [professors] [are confident]]
b. only$_C$ [GEN [if the sun shines] [we play soccer]]

We need to ask: what are the alternatives in the domain of *only* in these examples? What is the focus structure of the prejacent?

For *only if*, there is an attractive option: assume that the focus is somehow such that the only relevant alternative to *if p, q* is *if not p, q*. Then, *only* would say that it is not true that *if not p, q*. This is arguably a fairly reasonable interpretation: from *only if p, q* we get *not (if not p, q)*. From there, we could proceed via the Excluded Middle to *if not p, not q*, and further via Contraposition to *if q, p*. Thus, we would be able to derive the convertibility of *only if p, q* and *if q, p*. (We will discuss the status of the needed principles of Excluded Middle and Contraposition in section 7.)

What would we have to say about the focus structure of the prejacent to get this result? Barker (1991, 1993, 1994) suggests that the relevant focus is on the auxiliary (if there is one) or on *if* itself. He gives some persuasive examples of *even if*-conditionals:

(62) a. Don't worry, the party will be fine even if Basil DOES turn up.
b. But even IF Basil turns up—which is highly unlikely—it is very improbable that he will cause any trouble, so the party won't be ruined.

The treatment of the example in (62a) is presumably unproblematic from the point of view of fairly standard assumptions. Focus on the auxiliary is interpreted as focus on the truth polarity of the sentence.[32] The relevant alternative to 'Basil does turn up' is 'Basil does not turn up'. The example in (62b) is a little more tricky: we would have to assume the relevant alternative to the complementizer *if* is *if . . . not*. Barker suggests that this is a problem for a Kratzer-style theory of conditionals since there *if* is not given much of a meaning, and he attempts to argue that these facts provide evidence for a pragmatic theory of *if*.[33]

Do such examples carry over to *only if*-conditionals? Perhaps they do:

(63) It probably won't rain and
a. the game will only be cancelled if it DOES rain.
b. the game will only be cancelled IF it rains.

These examples could thus also be analyzed as involving focus on the polarity of the *if*-clause.[34]

Unfortunately though, the analysis would not be able to carry over to the generic examples where there is no way of focusing that would signal the negation of the common noun phrase as the relevant alternative.

Luckily, there seems to be another way in which we could get the right meaning. We could assume that (i) focus is on the whole restriction of the implicit quantifier, (ii) the domain of alternative restrictions includes very specific kinds of restrictors. To get the idea, consider the bare plural example *Only professors are confident.* Assume quite plausibly that there is focus on the common noun phrase *professors*, that the focus does not include the quantificational operator, that therefore all alternatives to the universal prejacent have (quasi-)universal force as well. If we assume that the domain of alternatives only includes propositions in which *professors* is replaced with contrasts like *students, politicians, steelworkers*, and so on, we would obviously get an incorrect meaning. In that case, the *only*-claim would be that not all (normal) students are confident, not all (normal) politicians are confident, not all (normal) steelworkers are confident, and so on. That would clearly be much too weak an interpretation. (60a) excludes <u>any</u> (normal) student, politician, or steelworker from being confident (unless she is a professor as well). But now we could avail ourselves of a trick: imagine that the domain of alternatives is much larger. Contrasts to the property of being a professor might include the property of being identical to Jane Smith, etc. Such a large domain of very specific alternatives would get us the right result.

The same maneuver can be contemplated for *only if*-examples, as suggested to me by Roger Schwarzschild (p.c.). Imagine that the alternatives to *if the sun shines* include restrictions such as *if it rains six and a half inches on Sunday September 8, 1996*. Then, denying that all of those situations are ones in which we play soccer will result in the appropriate force.

Can we safely assume that in all of the relevant examples focus is on the whole restriction of the prejacent quantifier? We can definitely find examples with such broad focus. The sun-shine example (60c) is presumably a case in point. Consider also:

(64) Only if [the QUEEN is home]$_F$ do they hoist the flag.

As pointed out to me by Satoshi Tomioka (p.c.), (64) does not convey that the flag is not hoisted if the King is home (too). It merely says that the flag is not hoisted if the Queen is not home. That means that even though there is a pitch accent on the subject, we would want to say that there is sentence focus here. This is unproblematic since pitch accents on subjects of unaccusative verbs are able to project to sentential focus, according to standard assumptions.

But when we look further we find that we cannot <u>always</u> assume that we have wide focus on the entire quantifier restriction.[35] Consider examples such as these:

(65) a. Only [BLUE]$_F$-feathered birds fly to the Galapagos Islands.
b. A: Can I call you tomorrow about this issue? Or would that get you mad?
B: No, go ahead and call me. I will only get upset if you call me [after MIDnight]$_F$.

These examples can clearly be read as involving narrow focus <u>internal</u> to the quantifier restriction. (65a) can be read as making a claim only about birds of various kinds of feathers, perhaps other kinds of flying animals, bats for example, migrate to the Galapagos Islands as well. (65b), due to Irene Heim, only talks about the speaker's getting upset about the timing of phone calls; in no way does it exclude the possibility that she might also get upset about the garbage not having been taken out. We need to be able to account for such examples as well. Here, the trick of assuming a large domain of very specific alternatives will not work. On to the last candidate analysis.

7 GENERICS, CONDITIONALS, EXCLUDED MIDDLE, AND CONTRAPOSITION

7.1 *The puzzle restated*

What would we need to assume to make the right predictions for cases where *only* attaches to a (quasi-)universal prejacent with focus inside the restriction of the (quasi-)universal quantifier?

(66) $\text{only}_C \left[\text{GEN} \left(\underset{\ldots[\ldots]_F\ldots}{p} \right) (q) \right]$

The schema in (66) covers both the case in (67a) where we have (quasi-) universal quantification over individuals (a generic sentence) and the case in (67b) where we have (quasi-)universal quantification over 'cases' (or situations, or worlds, or states of affairs; a conditional sentence):

(67) a. Only [BLUE]$_F$-feathered birds fly to the Galapagos Islands.
b. Jane will only get upset if you call her [after MIDnight]$_F$.

Our semantics for *only* would say the following about such structures. The assertion of the *only*-sentence is that none of the relevant alternatives to the prejacent is true. The alternatives to the prejacent are (quasi-)universal claims that differ from the prejacent in (part of) the restriction of the (quasi-)universal quantifier. Therefore, (67a) would deny that all normal red-feathered birds fly to the Galapagos Islands, that all normal green-feathered birds fly to the Galapagos Islands, and so on for all relevant contrasts to blue. And (67b) would deny that in all normal cases where you call Jane before midnight she will get upset. But these predicted truth-conditions seem much too weak. (67a) is actually falsified by the existence of one normal red-feathered bird that flies to the Galapagos Islands. (67b) is falsified if Jane got upset because of one late phone call.

Let me lay out the logical situation here. For the moment, let me ignore the Horn-ingredient, the presupposition or implicature that the prejacent is true. Assume also that the relevant contrasts to p are p′ and p″. What we have then is this:

(68) $\text{only}_C \left[\text{GEN} \left(\underset{\ldots[\ldots]_F\ldots}{p} \right) (q) \right]$

iff $\neg[\text{GEN}(p')(q)]$ & $\neg[\text{GEN}(p'')(q)]$ (By the semantics of *only* and focus)

At this point, it would be really nice if we could assume that GEN obeys two classic principles: the Excluded Middle and Contraposition. Because then we could proceed as follows:

(69) $\text{only}_C \left[\text{GEN}\left(\begin{matrix} p \\ \ldots[\ldots]_F\ldots \end{matrix} \right)(q) \right]$

$$\begin{array}{ll} \text{iff } \neg[\text{GEN}(p')(q)] \ \& \ \neg[\text{GEN}(p'')(q)] & \text{(By the semantics of } \textit{only} \text{ and focus)} \\ \text{iff } [\text{GEN}(p')(\neg q)] \ \& \ [\text{GEN}(p'')(\neg q)] & \text{(Excluded Middle)} \\ \text{iff } [\text{GEN}(q)(\neg p') \ \& \ [\text{GEN}(q)(\neg p'')] & \text{(Contraposition)} \end{array}$$

If we then assume that in all relevant cases one of p, p′, or p″ is true, we can deduce that GEN(q)(p). We would have reached the traditional meaning of our sentences.

Our problem now is that universal quantifiers do not in general obey the principle of the Excluded Middle. If not every A is a B, it doesn't follow that every A is a non-B, but merely that some A is a non-B. But of course, what we know about the semantic behavior of universal quantifiers like *every* is quite irrelevant here. The structures that we are investigating involve not the determiner *every* but the implicit quantifiers posited to give a semantic analysis of generic sentences and conditional sentences. Perhaps then, we should seriously contemplate the possibility that these implicit quantifiers do obey the Excluded Middle.[36]

7.2 The Excluded Middle

There are two ways that I can see to validify the Excluded Middle for generics and conditionals. One approach assumes that these kinds of sentences involve reference to an entity about which a claim is made. Negating such a claim then amounts to the same thing as attributing the contrary property to that entity. The other approach traces the Excluded Middle back to a presupposition carried by the implicit quantifier in such structures.

7.2.1 The entity approach

Take a sentence about the entity John: *John left*. Denying such a statement by *It is not true that John left* amounts to the same as attributing the predicate *did not leave* to John. Proper names thus trivially satisfy the Excluded Middle.

For conditionals, Stalnaker has argued that their interpretation involves reference to a single world selected from among the worlds in which the antecedent of the conditional is true. Stalnaker's assumption can be cast within our sketch of an analysis of GEN as follows: the selection function selects one case from the domain of quantification supplied by the *if*-clause.

If we now deny the truth of a conditional *if p, q*, what we are saying is that the selected *p*-case is not a *q*-case. This amounts to asserting that the selected *p*-case is a *non-q*-case. Thus, Stalnaker's semantics for conditionals validates the Excluded Middle. Lewis (1973a, b) has attacked Stalnaker's assumption and Stalnaker (1968, 1981, 1984) has defended it. We will soon come back to one of the moves in this debate.

Carlson (1977a) argues that bare plurals are proper names of (natural) kinds. For example, *Mammals give live birth* attributes to the kind 'mammal' the predicate 'gives live birth'. Whether such kind-level predications can be reduced to or supervene on (quantificational) facts about individual members of the kind is not relevant to the logical form of such examples, which is non-quantificational. Some of our problematic sentences would get the following meanings:

(70) a. Only $[\text{MAMmals}]_F$ give live birth.
'Among the relevant alternatives, the only kind that gives live birth is the kind "mammals"'.
b. Only owners of $[\text{RED}]_F$ cars need to pay extra insurance.
'Among the relevant alternatives, namely owners of cars of a certain color, the only kind that needs to pay extra insurance is the kind "owners of red cars"'.
c. I only like $[\text{FRENCH}]_F$ movies.
'Among the relevant alternatives, namely kinds of movies, the only kind that I like is the kind "French movies"'.

Given that (70a) denies that the kind 'reptiles' gives live birth can we infer that any animal that gives live birth is not a reptile? What we have is that the kind 'reptiles' doesn't give live birth. Does this entail that no reptile gives live birth? Offhand we wouldn't know, because we don't know what it means for a kind to give live birth or what it means to deny that a kind gives live birth.

But, in Carlson's account, we have the necessary leeway to introduce stipulations about generic properties, about predicates generated by the generic predicate operator *Gn*. One such stipulation might be that if a kind has the generic properties *Gn(P)*, then a significant number of k-individuals must have the individual-level property P. The stipulation that we need to get the right readings for *only*-sentences is this:

(71) The Generic Excluded Middle
For any kind k and any property P,
if $\neg[\text{Gn}(P)](k)$, then $\neg \exists x \in k{:}\ P(x)$.

When a kind is denied to have a generic property P_k, then any of its individuals cannot have the corresponding individual-level property P_i.

Here then in a nutshell is this analysis of *only* + bare plurals: *only Qs are Ps* says that no kind R alternative to Q has the property P. If the property is a stage-level property, that means that R doesn't have any instantiations that satisfy P. If the property is a generic property that means that R doesn't have Gn(P), which in turn means that no instantiations of R have P (by the Generic Excluded Middle).

Such an account would explain Carlson's observation (1977a: 84–5) that the negation of a generic sentence is always also a generic sentence:

(72) Bill doesn't like wombats.

This has no reading where the generic force is negated, no reading along the lines of 'it's not true that Bill likes wombats IN GENERAL, just that he likes SOME of them'.

Unfortunately, Carlson's analysis would not extend to other cases we considered. Singular indefinite generics do not allow kind-level predication, but they do give rise to the readings under *only* that we are interested in:

(73) a. #A bird is common. (vs. Birds are common).
b. Only a bird has feathers.

To analyze (73b) we have to posit a quantificational operator GEN. At least here, we cannot obtain the Excluded Middle from appealing to reference to kinds.

I'd like to discuss one more example of an analysis that derives the Excluded Middle from reference to an entity. Löbner (1985, 1987a, b) argues that definite plural noun phrases have the logical property of completeness ('If the predicate P is false for the NP, its negation not-P is true for the NP'). Consider a situation where all of ten children are playing, among them are three boys and seven girls. The following judgments seem to be natural:[37]

(74) TRUE: The children are playing.
FALSE: The children are not playing.
?: The children are boys.

He writes: 'the referent of a definite NP cannot be split in case the predicate holds only for some part of it, but not for the whole. Without any differentiating modification of the predication, the alternative is just that of global truth or global falsity. If it is impossible to apply the predicate or its negation globally it fails to yield a truth-value' (1987a: 185). In Löbner (1987a: 83), he calls this the 'presupposition of argument homogeneity', which says that 'the argument of a predication is homogeneous with respect to the predication'.

In the following section, I will sketch an approach that obtains the

Excluded Middle for generic sentences and conditional sentences without making special assumptions about ontology.

7.2.2 The Homogeneity Presupposition

Lewis criticizes as unrealistic Stalnaker's assumption that a single antecedent world is selected by the selection function involved in the semantics of conditionals. Taking for granted that what the selection function selects from among the antecedent worlds is the world(s) most similar to the evaluation world, it is unlikely that there is only one such most similar world. Stalnaker responds that one could simply assume that in such cases a supervaluation procedure is used to obtain the proper interpretation. If all of the most similar worlds behave the same with respect to the consequent proposition, it won't matter which one of them is selected. In effect then, conditionals à la Stalnaker presuppose that all of the selected worlds are uniform with respect to the consequent. What I would like to suggest is that this is a presupposition tied to the implicit operator GEN.

Here is a precedent: Janet Fodor argues in her dissertation (1970: 159–67) that both definite plurals and generic bare plurals carry what she calls an 'all-or-none' presupposition. If someone says that the children are asleep, it is presupposed that either all of them are asleep or none of them, and it is asserted that all of them are asleep. This presupposition explains why saying that it is false that the children are asleep amounts to claiming that none of them is asleep. Similar thoughts apply to generic bare plurals.

Note that this is very similar to Löbner's argument two decades later. However, Löbner takes an approach where plurals refer to higher-order entities and then assumes a principle that says that properties attributed to such entities have to be uniform with respect to the constituents of that entity. Fodor, on the other hand, assumes implicit quantification and attributes an 'all-or-none' presupposition to the implicit quantifier.

This then is what I propose to assume: GEN is lexically specified to trigger a Homogeneity Presupposition, which means that generic bare plural sentences and bare conditional sentences will obey the Excluded Middle:[38]

(75) <u>The Homogeneity Presupposition</u>
$[\![\textsc{gen}]\!](f)(p)(q)$ is only defined for w if
$[\forall x \in f(w)(p){:}\ q(x)] \vee [\forall x \in f(w)(p){:}\ \neg q(x)]$

From this it follows directly that the Excluded Middle is obeyed:

(76) <u>The Excluded Middle</u>
$[\![\textsc{gen}]\!](f)(p)(q)$ is false in w iff $[\![\textsc{gen}]\!](f)(p)(\neg p)$ is true in w, or shorter:
$\neg[\![\textsc{gen}]\!](p)(q)$ iff $[\![\textsc{gen}]\!](p)(\neg q)$.

Ultimately, we would hope to explain why the Homogeneity Presupposition is observed with implicit quantification as in (77) but not with overt quantification as in (78):

(77) a. Are the children asleep? No.
b. Do mammals lay eggs? No.
c. Will this match light if I strike it. No.
d. Would John have passed the test if he had studied for it? No.

(78) a. Are all the children asleep? No.
b. Do all mammals lay eggs? No.
c. Will this match necessarily light if I strike it?
d. Would John necessarily have passed the test if he had studied for it? No.

The idea behind the Homogeneity Presupposition is that a speaker who chooses a sentence involving GEN rather than one of the overt quantifiers signals that it is presupposed that the cases in the domain of quantification are uniform with respect to the property attributed by the scope of the quantifier. Take someone who asks *Do mammals lay eggs?* Choosing GEN signals that it is taken for granted that mere mammalhood will determine whether an animal lays eggs or not. Therefore, either all mammals lay eggs or none of them does (modulo irrelevant exceptions).

The Homogeneity Presupposition may be subject to contextual cancellation. Paul Portner (p.c.) gave me the following example:

(79) A: I need a kind of bird which is always black (for my poem, I'm trying to finish the line 'Quoth the x, . . .'). I'm considering ravens, eagles, and vultures. I've seen black examples of each. Do you know whether any of them are consistently black?
B: RAVens are black.

Clearly, B can't <u>presuppose</u> that ravens are all black or all non-black. That is what A is asking. What is important for my analysis of our *only*-sentences is that the Homogeneity Presupposition is at work there; no reason for it to be cancelled seems available.

Larry Horn (p.c.) objects to the Homogeneity Presupposition. He finds himself unconvinced by my claim that we can't deny that humans are violent without asserting the contrary claim with inner negation. He admits that the most natural way of rejecting the generic claim is by using an overt quantifier: 'No, you're wrong. Humans aren't necessarily violent.' But he does think that one can deny the generic without an overt quantifier: 'No, you're wrong. Humans are NOT violent. Just SOME humans are.' For me, such examples, if possible, have to involve metalinguistic or echoic negation.[39]

Krifka (1996) talks about some of the same data that motivate us to propose a Homogeneity Presupposition but argues that they can be explained by a process of pragmatic strengthening.[40] I don't know whether it is crucial that we assume that Homogeneity is a presupposition. Perhaps all we need is that it is an assumption that can feed the inferences that we automatically draw from a statement. Perhaps we don't have to conclude that the Excluded Middle is part of the lexical meaning of GEN, as long as certain pragmatically derived inferences are available to the semantics.

7.3 *Contraposition*

We could stop here. Perhaps, *only if p, q* is best paraphrased as *if not p, not q*, which is of course what we get in our analysis once we obtain the Excluded Middle. Perhaps also, it is enough to predict that *only ps are qs* amounts to the claim that *non-ps generally are non-qs*. But, just out of curiosity, what would be involved in going further to salvage traditional intuitions and getting *only if p, q* to entail *if q, p* and getting *only ps are qs* to entail that *qs are ps*?

Let us consider what we would need:

(80) What we now predict (assuming the Homogeneity Presupposition):

$$\text{only}_C \left[\text{GEN} \left(\begin{matrix} \text{p} \\ \ldots [\ldots]_F \ldots \end{matrix} \right) (\text{q}) \right] \approx \text{GEN}(\neg\text{p})(\neg\text{q}).$$

What we might want:

$$\text{only}_C \left[\text{GEN} \left(\begin{matrix} \text{p} \\ \ldots [\ldots]_F \ldots \end{matrix} \right) (\text{q}) \right] \approx \text{GEN}(\text{q})(\text{p}).$$

The obvious way to get this would be to say that the implicit quantifier involved in our structures allows Contraposition: $\text{GEN}(\neg\text{p})(\neg\text{q}) \Leftrightarrow \text{GEN}(\text{q})(\text{p})$.

Contraposition is an inference that the standard universal quantifier supports. It is also supported by material implication and by strict implication. It is however not supported in the Stalnaker–Lewis semantics for conditionals. Since we drew considerable inspiration from that semantics, we should be skeptical about the prospects for Contraposition being supported by GEN. In the following discussion, I will concentrate on Contraposition in bare conditionals. But parallel considerations should apply in the case of generic sentences (Contraposition hasn't been discussed much in the literature on generics).

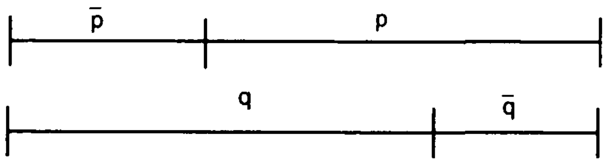
Here are two counter-examples to Contraposition for conditionals:

(81) *Failure of Contraposition*
 a. If it rained, it didn't rain hard.
  $\not\Rightarrow$ If it rained hard, it didn't rain.
 b. (Even) if Goethe hadn't died in 1832, he would still be dead now.
  $\not\Rightarrow$ If Goethe were alive now, he would have died in 1832.

The basic move that invalidates Contraposition in the Stalnaker–Lewis semantics is this. Recall that the conditional does not make a claim about simply every antecedent case, nor even about every contextually salient antecedent case. The idea is there is a (contextually salient) selection function that for any conditional selects a subset of the antecedent cases to quantify over. Contraposition then fails because the fact that the selected *p*-cases are *q*-cases does not preclude a situation where the selected *non q*-cases are also *p*-cases.

Take the Goethe-example and suppose that the selection function here is based on a comparative similarity relation, so that the antecedent cases selected are those that are maximally similar to the evaluation world. The selected *p*-cases in which Goethe didn't die in 1832 are all *q*-cases where he nevertheless dies (well) before the present. But of course, the selected (in fact, all) *non-q*-cases (where he is alive today) are also *p*-cases where he didn't die in 1832. Here's a picture of the situation:

(82) $\bar{p}$ = Goethe died in 1832 p = Goethe didn't die in 1832
 q = Goethe died before now $\bar{q}$ = Goethe is alive now



Counter-examples to Contraposition are often given in the form of *even if*-conditionals. The reason can be intuited from the picture: the crucial fact is that *q* is true throughout the selected ranked *p* and *non-p*-cases. We'll soon come back to this fact.

Let us look again at the semantics of GEN, which at the moment looks like this:

(83) For σ either e or s, for all p, q $\in D_{\langle\sigma,t\rangle}$, f $\in D_{\langle s,\langle\sigma t,\sigma t\rangle\rangle}$, and worlds w:
 $[\![\text{GEN}]\!]$(f)(p)(q) is defined for w only if
  (i) $\exists x \in f(w)(p)$,
  (ii) $[\forall x \in f(w)(p): q(x)] \vee [\forall x \in f(w)(p): \neg q(x)]$.
 Where defined, $[\![\text{GEN}]\!]$(f)(p)(q) is true in w iff $\forall x \in f(w)(p): q(x)$.

The detail in here which gives rise to the particular logical properties of the Stalnaker–Lewis semantics is the fact that the selection function f is sensitive to the antecedent *p*.

There is an alternative, dismissed in most work on conditional semantics but defended in my paper 'Conditionals in a Dynamic Context' (von Fintel 1997a). I argue there that what happens in the apparent counter-examples to Contraposition (and some other inference patterns) is that the context in which the conditional is evaluated shifts midway through the example. The positive proposal is that conditionals quantify over a contextually restricted set of relevant cases. They carry a presupposition that the antecedent proposition is compatible with the set of relevant cases. If that presupposition is not fulfilled, because we have moved to considering a proposition not previously considered, the contextual domain will have to be adjusted. It is the dynamics of domain restriction that leads to non-monotonicity, which is not a strictly semantic fact but a fact of discourse dynamics.[41]

The semantics for GEN that comes out of this proposal looks as follows:

(84) For σ either e or s, for all p, q $\in D_{\langle\sigma,t\rangle}$, f $\in D_{\langle s,\sigma t\rangle}$, and worlds w:
$[\![\text{GEN}]\!](f)(p)(q)$ is defined for w only if
(i) p is compatible with f(w): $\exists x \in f(w)$: p is true of x,
(ii) $[\forall x \in f(w): p(x) \rightarrow q(x)] \vee [\forall x \in f(w): p(x) \rightarrow \neg q(x)]$.
Where defined, $[\![\text{GEN}]\!](f)(p)(q)$ is true in w iff $[\forall x \in f(w): p(x) \rightarrow q(x)]$.

Note that here the selection function is replaced by a function that assigns a set of relevant cases to the evaluation world. Since there now is no fickle sensitivity to the antecedent *p*, there will be fewer cases where logical inferences are disrupted.

This perspective leads to the following diagnosis. Something very much like Contraposition will be valid under two additional conditions: (i) $\neg q$ is compatible with the context (i.e. if *q* doesn't hold throughout the domain of relevant cases), and (ii) *q* doesn't presuppose *p*. The counterexamples to Contraposition presented in the literature fail one or both of these conditions.

Condition (i) is fulfilled by most ordinary conditionals. If *q* holds throughout the domain, then *p* is not a condition for *q*. Ordinary conditionals may even carry a presupposition that (i) holds (discussed among others by Kratzer in her dissertation). An exception are concessive conditionals/semifactuals/*even if*-conditionals:[42]

(85) (Even) if Goethe hadn't died in 1832, he would still be dead now.
$\not\Rightarrow$ If Goethe were alive now, he would have died in 1832.

The elements *even* and *still* explicitly signal that the consequent is true throughout the relevant sphere of cases. A new conditional with the negation of the original consequent as its antecedent would therefore have to move outside the previous contextual domain. The premise, *(Even) if Goethe hadn't died in 1832, he would still be dead now*, explicitly signals that all relevant cases are cases in which Goethe is dead. The antecedent of the conclusion then clearly moves outside this realm of cases by supposing that Goethe was still alive. This kind of example therefore demonstrates that Contraposition appears invalid if the consequent of the conditional holds unconditionally throughout the relevant domain. There are counter-examples that lack the explicit marking seen in (85):

(86) a. If it rained, it didn't rain hard.
$\not\Rightarrow$ If it rained hard, it didn't rain.
b. If she wrote a letter to Santa Claus, she didn't get an answer from him.
$\not\Rightarrow$ If she got an answer from Santa Claus, she didn't write a letter to him.

Both examples still have the property that the consequent is true throughout the relevant domain. (86a), due to Jackson I believe, explicitly says that in all of the cases in which it rained, it didn't rain hard. But of course, if there are relevant cases in which didn't rain, it must a fortiori have not rained hard in them. Thus, throughout the domain it didn't rain hard. The same goes for (86b), from McCawley (1993). In both cases then, the contraposed version will take us outside the relevant domain, thus creating the impression that Contraposition is invalid.

Both examples have an additional property: they say *if p, not q*, where *q* presupposes *p* in some sense. Thus, it becomes strange indeed to say *if q, not p*. Not only do the contraposed versions take us outside the relevant domain, they can in fact never be true. This is then another possible source of counterexamples to Contraposition. And this may seem to be a much more pervasive problem than the one created by concessive conditionals. Here are some more example, due to McCawley:

(87) a. If I do heavy exercise, my pulse goes above 100.
$\not\Rightarrow$ If my pulse doesn't go above 100, I don't do heavy exercise.
b. If the Police start tapping your phone, you're in danger.
$\not\Rightarrow$ If you're not in danger, the Police don't start tapping your phone.

McCawley's diagnosis of what goes wrong here seems correct: it matters which clause is the antecedent and which the consequent, because there are asymmetric temporal/causal dependencies involved. In effect, the consequent depends on the antecedent in its interpretation. Such donkey dependencies, whether temporal/causal or having to do with the reference of noun phrases, are of course extremely common. Do we have to give up on Contraposition altogether?

Not really. What these examples show is that Contraposition is not a recipe for constructing paraphrases by switching antecedent and consequent and inserting negation into both. Contraposition is a property of the semantics of the quantifier GEN. What we have is this:

(88) For any f, p, q, w: $[\![\text{GEN}]\!](f)(p)(q)$ is true in w iff $[\![\text{GEN}]\!](f)(\neg q)(\neg p)$ is true in w.

But since there can be a number of implicit semantic ingredients in these structures we are not guaranteed that simple syntactic operations concluded at the surface will give us the proper contraposed form of a conditional statement.

If part of the original structure was an implicit dependency between the two sets of cases, that dependency has to be maintained. Try it on a simple example that involves an explicit temporal dependency:

(89) If I call John at some time in the night, he calls me (back) ten minutes later.

What should the contraposed conditional express? (89) leads us to infer that at any point in time at which John doesn't call me, I can't have called him ten minutes earlier. Otherwise, we'd have a situation that would falsify (89). There doesn't appear to be an ear-pleasing way of phrasing the contraposed version. But Contraposition still holds in a certain sense. Every relevant case in which the consequent is false is one in which the antecedent is also false. Let us try this a little more formally. Assume that the cases that (90a) quantifies over are times (across a contextual domain of epistemically accessible times in epistemically accessible worlds). Assume that what the sentence expresses is formalized as in (90b), which roughly says that all relevant times at which John wins the race are times that are followed (closely?) by a time at which we celebrate:

(90) a. If John wins the race, we will celebrate.
b. $\text{GEN}(f)(\lambda t\ \text{wins}(j,t))(\lambda t\ \exists_{t' \geq t}(\text{celebrate}(we,t')))$

Now, contrapose (90b) and you get:

(90) c. $\text{GEN}(f)(\lambda t \neg \exists_{t' \geq t}(\text{celebrate}(we,t')))(\lambda t \neg \text{wins}(j,t))$

This says that any relevant time that is not (closely) followed by a time at which we celebrate is a time at which John doesn't win the race. Under reasonable assumptions (which I leave to the reader to identify), (90c) is now equivalent to the following:

(90) d. $\text{GEN}(f)(\lambda t \neg \text{celebrate}(\text{we},t))(\lambda t \neg \exists_{t' \leq_t} \text{wins}(j,t'))$

This says that any relevant time at which we don't celebrate is one that is not (closely) preceded by a time at which John wins the race. Arguably, this is something we can express in English as follows:

(90) e. If we don't celebrate, John must not have won the race.

So, once we consider the semantics of the original conditional in detail, we see that its contraposed version will have to be something like (90e). The apparent counter-examples in (87) are not really counter-examples to Contraposition, they just show that the proper contraposed versions have to respect the implicit temporal/anaphoric dependencies between antecedent and consequent.

The reader might perhaps think that I have been unfair to McCawley here. His claim surely is that the relation of temporal dependence is build into the semantics of the conditional operator and not part of the consequent, as I have assumed above. Such a complex operator, which contains the reference to temporal/causal dependency, then clearly does not support Contraposition. But note that the 'backtracking' conditional in (90e) is a counterexample to such an analysis. Clearly, the temporal dependency here is reversed as signaled by the temporal/aspectual marking in the sentence. I submit therefore that temporal dependency is not built into the conditional quantifier, but is carried by elements in the antecedent and consequent clauses.

If we can agree that the quantifier *every* should validate Contraposition (as the primordial universal quantifier of natural language, modulo the fact that it is a word in a rather recent language), we can see that we should not be too dismayed by McCawley-style counter-examples. Consider:

(91) Every man who stole a car abandoned the car hours later.
$\not\Rightarrow$ Every one who did not abandon the car hours later is not a man who stole a car
$\not\Rightarrow$ Every one who did not abandon a car is not a man who stole the car hours before.

There are two anaphoric connections between the quantifier restriction and the scope: (i) the dependency between the indefinite *a car* and the definite *the car*, and (ii) the dependency between the time of the theft and the time of the abandoning. Both dependencies need to be handled with gloves when we check the validity of Contraposition. But once we are careful we will see that (91) lets us infer that if there is someone who did not abandon a car, he is not a man who stole the car hours before.

Eventually, I think there will be more to be said about how logical inferences fare in a setting that deals in a proper way with the dynamic of anaphoric dependencies. There are plenty of subtleties remaining in the analysis of anaphoric connections and dependencies in conditionals that we have to leave aside here. I have dealt with some of these issues in other work and will certainly return to them at some future occasion.

When we control for the two factors isolated in this discussion (when we ensure that q doesn't hold unconditionally and that q doesn't presuppose p), we get intuitively valid instances of Contraposition:

(92) a. If Harry is a cat, then he is a mammal.
⇒ If Harry is not a mammal, then he is not a cat.
b. [We don't know where Harry and Mary are, but we know they avoid each other:]
If Harry were in Athens, then Mary would not be in Athens.
⇒ If Mary were in Athens, then Harry would not be in Athens.

Thus, there seems to be something fundamentally right about the old doctrine of Contraposition.[43] Counter-examples come from a well-defined class of cases. The dynamic strict analysis that I argue for in 'Conditionals in a Dynamic Context' gives us the right handle on where to find counter-examples and where to find supporting examples.

One kind of counter-example will in fact never arise with *only if*. There will be no cases of *only if p, q* such that the converse version *if q, p* is strange because there are no accessible *q*-cases. Since the prejacent *if p, q* is presupposed, we are automatically presupposing that there are accessible *q*-worlds. That means that the contraposed conclusion will not force us to change the context to make the set of accessible worlds compatible with *q*.

Let us end this section by considering a counterexample to the strong analysis of *only if* advocated here. It is due to Robert Stalnaker and is cited by Appiah (1993):

(93) Count Dracula is coming only if we invited him.
Nobody in fact invited him.
∴ If he is coming anyway, he'll be here without an invitation.

The point is that the conclusion (which seems valid) is incompatible with the converse of the *only if*-sentence (*If Count Dracula is coming, we invited him*). So it seems that we shouldn't advocate the strong analysis of *only if*. But that again commits the fallacy of shifting contexts. First note that from the premises we can validly conclude that Count Dracula is not coming. All of the relevant worlds are such that he isn't coming. Then the antecedent of the conclusion takes us to far-fetched worlds not previously considered. This new conditional in this new context can be true without the old *only if*-conditional (and its converse) in the old context being false. But, now note that the old conditional in the new context is in fact false. We can respond to (93) with:

(94) But that means that you think that he won't be coming ONLY if we invited him. He might be coming without an invitation.

So, in the new context the first premise is in fact false, which means that the argument in (93) is built on contextual quicksand. In fact however, the argument in (93) is misleadingly stated anyway since the conclusion follows from the second premise alone. The *only if*-conditional plays no role in it.

I claim that we can assume that our implicit quantifiers obey the Excluded Middle and validate Contraposition. Thus we can achieve a compositional analysis of the investigated structures, which to a large extend does justice to some old intuitions about what such sentences mean.

8 CONCLUSION

Our aim was to develop a compositional semantics for sentences involving *only* and bare plurals and for *only if*-conditionals. We saw that an account that can deal with the whole variety of relevant sentences had to assume throughout that the structure modified by *only* was a quantificational construction, although there is no overt morpheme expressing the quantificational force. For some examples, it may be enough to assume that there is an implicit existential quantification prejacent to *only*. For most examples, and particularly for all of the conditional examples, we arguably need to deal with a prejacent (quasi-)universal quantification. Some of those can be dealt with by assuming wide focus on the entire quantifier restriction: the large set of relevant alternatives in these cases might suffice to account for the strong meaning of these examples. Lastly, however, we have to deal with examples where focus falls strictly inside the restriction. For those, the perceived meanings could only be accounted for by making substantial assumptions about the semantics of the underlying implicit quantification: those quantifiers carry a Homogeneity Presupposition and validate Contraposition.

What we learn from this exercise then, is that we can find out about the nature of implicit quantification in natural language by looking at how such structures combine into even more complex constructions. Another lesson, independent of the particular results argued for here, is that analyses in this area should attempt to account for both generic sentences and conditional sentences in some more or less unified way, because of the close semantic parallels between them.

I append some remarks about structures where the prejacent to *only* is overtly quantified. I also discuss seemingly simple examples where *only* combines with a name.

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APPENDIX A: OVERT QUANTIFIERS UNDER *ONLY*

What happens when *only* attaches to a prejacent that is overtly quantified? Here I have found an astonishing gap between theory and reality. Consider a simple example like (95):

(95) Only every [YOUNG]$_F$ girl cried.

There are three important facts about (95): (i) it does not seem to allow the expected reading where the universal force is constant across all alternatives. In other words, (95) is not affected by focus in the usual way; (ii) largely, only one interpretation is available, namely the one where no one else cried; (iii) perhaps most importantly, (95) is (almost) unacceptable.

Our theory so far predicts that in (95) the alternatives would all involve the same underlying quantificational force, here a universal force. All alternatives would be about girls of various kinds, here perhaps older girls. So (95) might in effect deny (96):

(96) Every older girl cited.

This would of course not exclude that <u>some</u> older girls cried. That's the prediction. (95) would mean something like the following paraphrases:

(97) a. Only the [YOUNG]$_F$ girls all cried.
b. Only among the [YOUNG]$_F$ girls did every one cry.

I have my doubts that (95) can really have that interpretation. Here are some other examples that we would expect to have an interpretation where all alternatives have the same (strong) quantificational force:

(98) a. All domestic cats can drink milk. Some native cats can, but not all. Some feral cats can, but not all. So we see with regard to the varieties of cats that only all [doMEstic]$_F$ cats are milk drinkers.[44]

b. While the referendum did in the end carry by a simple majority, most GROUPS of voters were against it. In fact, only most [WHITE MIDDLE-class MALES]$_F$ voted for it. There was not much support among blacks, women, and lower income voters.

c. I only recommended every student who got an [A]$_F$.

d. Only everyone from Middletown was present at the meeting. (Hoeksema & Zwarts 1991)

e. Only every woman was present at the meeting. (Hoeksema & Zwarts 1991)

On the whole, these examples are horrible.[45]

When pressed, native speakers seem to assign such sentences a meaning that excludes everything else having the property in question. (95) is read as claiming that no one else cried, no older girls, no boys, no one. My suspicion is that this is more of a rescue strategy than a genuine semantic analysis. But let's briefly see how we might account for it. We could ignore the normal focus projection principles and assume that the focus in (95) projects beyond the adjective. We could, for example, assume that the whole NP in (95), including the universal quantifier, is in focus. We would then have to figure out what the legitimate alternatives to the universal quantifiers are. Krifka (1993) proposes a stipulation. He argues that a focussed universal quantifier only competes with other filters. This would essentially predict that (95) means that noone other than the young girls cried. Irene Heim (p.c.) suggested another possibility: we could assume that the focus in (95) is on the whole restriction, excluding the universal quantifier. This would of course again violate the usual focus projection. We could then make use of the fact that for any entity in the universe there is the property of being identical to that entity. If all of these properties are legitimate alternatives, denying the family of universal statements that every entity that has such a property cried will result in the claim that noone else cried. (This is the strategy that we considered in section 5, where we argued it couldn't account for cases with genuine narrow focus. But here the narrow focus readings do not seem to exist.) A third possibility is to abandon alternative semantics at least for these examples and define a meaning for *only* that applies directly to the meaning of a quantifier without being focus-sensitive. This is suggested for example by Groenendijk & Stokhof (1984). I will not discuss their analysis because it does not obviously carry over to the focus-sensitive *only* that we have been talking about.

Let me say again that I am deeply suspicious of sentences like (95). Why then should these configurations be unacceptable? I don't really know. Previous researchers have not tended to take the unacceptability of these structures seriously. Groenendijk & Stokhof (1984: 411, fn. 42) write: 'the least we can say is that we've grown accustomed to it.' Bonomi & Casalegno (1993: 7) write: 'some speakers find sentence such as *Only [every boy]$_F$ cried* a little unnatural, but whatever the explanation of this fact might be, there is no doubt that *only* can associate with NPs whose determiner is *every*, and we must account for this case, too.'

Let us turn to examples where *only* combines with various kinds of 'conditional' quantifiers. First, recall that there is no problem with existential quantifiers restricted by *if*-clauses under the scope of *only*:

(99) a. Only if it rains may we cancel the game.
b. Only if it had rained might we have cancelled the game.
c. Only if the Queen is home do they sometimes hoist the flag.
d. Only if you're over 21 are you allowed to buy alcohol.

The logical structure of these constructions is as follows:

(100) only $(\exists_C(\text{if} \ldots [x]_F \ldots)(q))$.

What we get is that alternative existentially quantified conditionals are denied. (99a) for example denies that it is possible in case of conditions other than rain that the game is cancelled. This directly means that any relevant case of the game being cancelled can only be a rain case. Hence, these *only if*-conditionals with an existential prejacent also license the converse inference.

Now, consider examples of prejacents that involve overt universal quantifiers: epistemic *must*, deontic *must/ought*, adverbial *always*:

(101) a. ??Only if it rained must they have cancelled the game.
??They only must have cancelled the game if it rained.
b. Only if the Queen is home do they always/invariably hoist the flag.
They only always/invariably hoist the flag if the Queen is home.
c. Only if you're planning to go to Africa are you obliged to get a malaria shot.
Only if you're planning to go to Africa do you have to get a malaria shot.
Only if you're planning to go to Africa ought you get a malaria shot.
Only if you're planning to go to Africa must you get a malaria shot.

You are only obliged to get a Malaria shot if you're planning to go to Africa.
You only have to get a Malaria shot if you're planning to go to Africa.
You only ought to get a Malaria shot if you're planning to go to Africa.
You only must get a Malaria shot if you're planning to go to Africa.

These sentences should all have the following logical structure:

(102) only $(\forall_C(\text{if} \ldots [x]_F \ldots)(q))$.

What *only* should be doing here is to deny alternative universally quantified conditions. What is different from our main examples is that overt universal operators do not obey the Excluded Middle. So we expect these sentences to have rather weak meanings, denying that all cases alternative to the prejacent antecedent verify the consequent. Because we can't apply the Excluded Middle, we can't go on to say that this means that all alternative cases such that the consequent does not hold. Such meanings are exactly what we get in (101b and c). The claim conveyed in (101b), for example, is that the only kind of case in which they invariably hoist the flag is when the Queen is home. It is not denied that they hoist the flag once in a while when the Queen is not home. This distinguishes the weak claim made in (101b) from the strong claim made in (91).

There are two observations to be made that don't follow from our analysis in this paper. First, note that it seems to be rather odd to have an epistemic universal in an *only if*-conditional. The examples in (101a) are not very good. The only thought I have about this at the moment is to try and relate this behavior of epistemic operators to Iatridou's discussion in her LI squib (Iatridou 1990).

The second observation concerns the behavior of deontic *ought* and perhaps also deontic *must* in *only if*-conditionals:

(103) You only ought to drink alcohol if you're over 21.
You only must drink alcohol if you're over 21.
Only if you're over 21 ought you drink alcohol.
Only if you're over 21 must you drink alcohol.

$\Rightarrow$ If you drink alcohol you ought to/must be over 21.

We seem to get a strong reading that entails the converse just as we did in our earlier paradigm cases. But it seems that we can't attribute this meaning to the Excluded Middle. These deontic operators do not obey the Excluded Middle. If it is denied that something ought to be the case, that does not amount to saying that the opposite ought to be the case. How then can we derive the meaning that (103) seems to have?

One possibility is that in (103) the overt deontic operator has scope over the *only if*-conditional, which itself involves an implicit quantifier over cases. We would have the following structure:

(104) ought[only$_C$(GEN(if you're [over 21]$_F$)(you drink alcohol))].

To get this, we would have to say that somehow the surface order 'only ought' is reversed at logical form. Such funny behavior of modals with respect to other operators is more widely attested, see for example the fact that *need not* means the same as *not need to* (cf. also fn. 27). The example then would be interpreted as saying that it ought to be case that (105) is true:

(105) You only drink alcohol if you're over 21.

We would treat this as *only* attaching to a universally quantified conditional prejacent. By our analysis, (105) will entail the converse of the prejacent:

(106) If you drink alcohol, you're over 21.

So (103) would end up to be saying something like 'it ought to be the case that whenever you drink alcohol you're over 21'. That would seem to be adequate.

APPENDIX B: *ONLY* AND NAMES

Perhaps the most counter-intuitive application of Rooth's cross-categorial semantics for *only* concerns cases where *only* combines with a proper name.

(107) [Only Einstein] understands this theorem.

Clearly, this means that no one other than Einstein understands this theorem (where the set of people quantified over is quite possibly restricted by the context). We don't, however, want to posit a *sui generis* operator *only*^{PN}, which combines with proper names and means 'no one other than', since such an operator would not be reducible to the propositional operator *only*^{S} (since proper names do not have a type ending in ⟨s,t⟩). What we can do instead is treat *Einstein* as denoting a generalized quantifier, a set of properties, namely the set of properties that Einstein has. The type of intensional generalized quantifiers is ⟨⟨e,st⟩,st⟩, a type that ends in ⟨s,t⟩, just what we need. Then we can define an operator *only*^{NP}, which combines with an implicit set of generalized quantifiers and a generalized quantifier. This operator is reducible to *only*^{S}:

(108) For all sets of quantifiers C, for all quantifiers q, all words w
$[\![\text{only}^{NP}]\!](C)(q)(P)$ is true in w iff $[\![\text{only}^{S}]\!](\{r(P)\colon C(r)\})(q(P))$ is true in w.

What we get then is that (107) claims that no generalized quantifier in C other than the one denoted by *Einstein* gives a true sentence when combined with the predicate *understands this theorem.*

Unfortunately, there seem to be far too many generalized quantifiers around. Clearly, *Einstein* in (107) is not competing with generalized quantifiers like *at least one human.* or *the most famous modern physicist.* On the level of propositions, (109) shouldn't compete with (110) or (111):

(109) Einstein understands this theorem.
(110) At least one human understands this theorem.
(111) The most famous modern physicist understands this theorem.

Our task should be to derive which quantifiers *Einstein* competes with from general principles. If we have to stipulate that names only compete with names, we might as well adopt a special meaning for *only* when combined with names, Krifka (1991, 1993) has a special rule: names only compete with other names. Actually, he says that names only compete with other (principal) filters, but that won't work in an intensional framework (*the most famous modern physicist* is a filter).

There is no problem with *at least one human*: this quantifier is actually entailed by *Einstein* (in an extended sense of entailment), if we assume that Einstein is essentially human. On the level of propositions, (109) logically entails (110).

The problem is much more complicated with *the most famous modern physicist*, this is not logically entailed by *Einstein*, since there are worlds in which Heisenberg is more famous. Unfortunately, it also not the case that *the most famous modern physicist* is lumped by *Einstein* (in the appropriately extended sense of lumping). According to Kratzer, a situation that supports the proposition about *the most famous modern physicist* has to be fairly large, it has to include all modern physicists at least. That means that the *Einstein*-proposition can be true in much smaller situations, which in turn means that it doesn't lump the modern physicists proposition.

So co-extensional descriptions present a real problem. We obviously can't lift a prohibition against co-extensional alternatives to the level of propositions: we can't exclude all co-extensional propositions from the set of alternatives, at least as long as co-extensional for propositions means having the same truth-value. That would fatally trivialize the semantics for *only*.

Can we make use of the fact that there is a lumping relation between the two propositions in the opposite direction? Any situation which supports the *modern physicist* proposition will also support the *Einstein* proposition. Can we exclude from the set of legitimate alternatives any proposition that is lumped by the prejacent proposition and also any proposition that in turn lumps the prejacent proposition? One might think that this move would create a problem with the proposition (112):

(112) The two most famous modern physicists understand this theorem.[46]

There is a world in which (112) lumps (109). Any situation that supports (112) will support (109). Can we exclude (112) from the domain of alternatives to (109)? Sure, why not? The *only*-claim will falter whether (112) is in C or not. It will falter because there is the competing proposition that Heisenberg understands the theorem. And that proposition is not excluded by any of our provisions about C.

Is there independent motivation for adding the new bilateral lumping exclusion? Well, it does seem to work in the case of Paula's still life as well. Here's the lunatic again:

(113) Lunatic: What did you do yesterday evening?
Paula: The only thing I did yesterday evening was paint these apples and these bananas over there.
Lunatic: This is not true. You also painted this still life. Hence painting these apples and these bananas was not the only thing you did yesterday evening.

Assuming that the still life is fairly minimalist and only contains those applies and those bananas, the ***still life*** proposition lumps, but arguably, is not identical to the ***apples and bananas*** proposition. The lunatic's response has to be rejected and the new bilateral lumping exclusion would do just that. (This may not be independent evidence, however, since it involves definite descriptions.) Perhaps, we should adopt the new principle:

(30g) For all sets of propositions C, propositions p, r, and worlds w:
$[\![\text{only}]\!](C)(p)$ is defined for w only if (i) $\exists r \in C$: r is true in w,
(ii) the focus structure of p constrains the extent of C,
(iii) no proposition in C is entailed by p,
(iv) no proposition in C is lumped by p,
(v) no proposition in C lumps p.

If defined, $[\![\text{only}]\!](C)(p)$ is true in w iff $\forall r \in C$ (r is true in w $\rightarrow r = p$).

NOTES

1 As we will discuss soon, the interpretation of such sentences is crucially affected by their intonational structure. Where relevant then, I will indicate the intended intonation. The conventions used here: pitch-accented syllables are shown in capitals, where the focussed phrase is marked with an F-subscript. The relation between pitch accent and focus is investigated in the literature on focus projection. For a recent survey, see Selkirk (1993).

2 See Kretzmann (1982) for an overview of the relevant medieval literature. Horn (1996) employs the term 'prejacent' as well, citing medieval sources.

3 McCawley (1993: 566, fn. 11) cites Sharvy (1979) as the first publication in which arguments are given that *p only if q* and *if p, q* are not equivalent. Strangely enough, McCawley doesn't cite his own earlier LI squib (1974), which already contained a counterexample to the traditional doctrine.

4 It appears that the terrain was well travelled in the Middle Ages (the first golden age of semantics). Horn (1996) somewhat wistfully cites Ockham, who after mentioning some out-of-the-way uses of *only* writes that 'since they are not as widely used as the ones we have dealt with, I will leave them to the specialists'. Horn comments: 'A glorious picture indeed: monasteries crammed to the spires with specialists on *only*, labouring away on the fine points of the semantics of exclusive propositions. Those were the days!' (Horn 1996: 27).

5 To accommodate a presuppositional component to the meaning of *only*, we

could add to (12) the presupposition that B is non-empty, which corresponds to the existential import that *all* arguably has with respect to its first argument A. We would also have to ensure that the determiner *only* can only apply to plural nouns, a property it would share with *all* and *most*, for example.

6 An early critical discussion can be found in Thijsse (1983). See de Mey (1991, 1996) for a dissenting opinion.

7 There is an observation, due to Taglicht (1984), that has received some attention in the literature:

i. a. They were advised to learn only $[\text{SPAnish}]_F$.
b. They were advised to only learn $[\text{SPAnish}]_F$.
c. They were only advised to learn $[\text{SPAnish}]_F$.

The sentence in (ia) is ambiguous, while the sentences in (ib) and (ic), where *only* is separated from its focus, are unambigous (keeping the focal structure constant). Rooth (1985: 90) suggests that the explanation is simply that since *only Spanish* is an NP it can undergo Quantifier Raising, and since there are two possible landing sites, we observe ambiguity. In the other sentences, there is no constituent *only Spanish* and so it cannot undergo QR, no ambiguity arises. McCawley (1988: 611f), who does assume that at some point there is a constituent *only Spanish*, has to appeal to rule-ordering or level-ordering (since he works in a Generative Semantics framework, what he says is that *only*-separation precedes Quantifier Lowering).

8 Recall that weak determiners are those that can occur in *there*-sentences, while strong determiners are those that can't; the relevant literature is large (Milsark 1977; Barwise & Cooper 1981; Higginbotham 1987; Keenan 1987; Lappin 1988; Partee 1988; de Hoop 1995a). See Musan (1997: Section 4.2.3) for an alternative account of the non-conservative reading of (19), based on a suggestion by Irene Heim. See also de Hoop (1995b), de Hoop & Solà (1995), and Büring (1995: 98ff).

9 Note that (20a) does not mean that all applicants are incompetent cooks, which is what the simple semantics in (12) would predict. So, we would have to revise the semantics of the determiner *only* to make it sensitive to focus.

10. In fact, as suggested in Horn (1996), one can observe that the putative determiner *only* would be conservative with respect to its second argument: *only men smoke* is equivalent to *only smoking men smoke*, at least if one is careful with the focus structure of the second sentence.

11. One might think that the determiner analysis would help us understand the existence of the complex expression *all and only*, which is a conjunction of the (apparent) determiner *all* and the item *only*. But this argument is undermined by doubts that *all* is a determiner itself (Partee 1995). Consider, for example, *all and only the foreign students*, where the collocation *all and only* applies to a full NP (note that this cannot be reanalyzed as a partitive structure along the lines of *all (of) the*, since *only* cannot occur with a partitive, cf. *only (*of) the foreign students*).

12. Other relevant works include Szabolcsi (1981a, b), Groenendijk & Stokhof (1984: Chapter 5), von Stechow (1991b), and Bonomi & Casalegno (1993).

13. An earlier example of this kind was given by McCawley (1970):

i. The judge only sent you to prison; your wife didn't leave you too.

McCawley (p.c.) notes that 'as with Heim's example, one "annoying circumstance" is being contrasted with others.'

14. One refinement to the sketch given in the text is to acknowledge that C will have to vary with the evaluation world. Thanks to Paul Portner (p.c.) for discussion.

15 For more on existence presuppositions of quantificational constructions, see for example, Heim & Kratzer (1997: section 6.2).

16 This talk of 'reading the speaker's mind' is somewhat loose talk. Perhaps, what the speaker is thinking never determines contextual parameters; see Gauker (forthcoming) for discussion. Two very different references on mind-reading are Bolinger (1972) and Baron-Cohen (1995).

17 See Rooth (1985, 1992) for more on this. There are in fact ways of overtly constraining the domain of *only*, e.g. we can specify the domain with an overt *of*-phrase:

i. Of the people at the party, only $[\text{JOHN}]_F$ got truly drunk.

Someone should figure out how this construction works.

18. This is a deliberately vague way of stating the fact that focus tells us about what C is.

19 I am grateful to Irene Heim for letting me see unpublished notes of hers on the topic of lumping and its consequences for the semantics of *only*. Bonomi & Casalegno (1993: 20, fn. 16) note the problem but do not pursue it in any detail. Kratzer also discusses a pedantic response to Paula's claim: the pedant ignores the tacit restriction to interesting things Paula did. Paula's and Kratzer's response is too conciliatory: they admit that strictly speaking Paula was wrong: she also looked out the window once. But, really that wasn't what Paula was talking about at all. So, the pedant should not be appeased.

20. As Paul Portner (p.c.) points out to me, the notion of lumping that I have to employ here is not quite the same as the one that Kratzer uses in the semantics of conditionals (for her, generic statements are true in any situation in any world they are true in). I will postpone discussion of the differences to a future occasion.

21 As mentioned above, Horn (1996) tries to connect the existential import of *only* to the existential import of *all*. While my rejection of the determiner analysis prevents a direct adoption of his proposal, in a more general sense I share his outlook. I would like to explore the idea that all of the presuppositions about the contextual domain C specified in (30f) follow from general principles of quantifier interpretation in natural languages. Keeping unwanted cases out of a quantifier domain is a problem that also emerges in the case of adverbial quantification. There it is crucial to the prospects for an event-based semantics (Dekker 1996; von Fintel 1997a, in progress).

22 See Bayer (1996) for a book-length study of such a theory.

23 The reference to kinds approach is due to Carlson (1977a, b); see also Chierchia (1996). The indefinites approach is due to Heim (1982); see also Wilkinson (1986, 1991), Krifka (1987), Krifka *et al.* (1995), and Diesing (1992).

24 For more on these options, see again Krifka *et al.* (1995).

25 Selection functions are of course well known from the Stalnaker–Lewis semantics for counterfactual conditionals. Formulating the semantics in terms of a selection function is only possible under what Lewis calls the Limit Assumption, which says that there will always be a set of maximally close antecedent cases. See Stalnaker (1981, 1984) and Warmbrod (1982) for a defense of this assumption, in the face of Lewis's arguments against it.

26 Note that, to make the example minimally euphonous, we have to rearrange the elements of (40b) on the way to (41b). I will not explore why this should be.

27 There is an interesting type of case where *only* combines with an existential modal:

i. John can only be at work.

An example like this is discussed by von Stechow (1991a). Note that (i) is felt to imply:

ii. John must be at work.

The way to get this, von Stechow shows, is to assume this logical form:

iii. only_C[can (John be (at WORK)$_F$)].

Understanding *can* in the usual way as existential quantification over worlds, (iii) denies that there are worlds where John is at home, at church, at the health club, etc. Hence, (ii) is implied. Note that to make this work, the logical scopes of *only* and *can* have to be the reverse of their surface order. This is of course reminiscent of other ill-understood facts about all modal auxiliaries: *can not* really means *not can*. Jim McCawley (p.c.) points out that this is a general property of modal auxiliaries except *should/must/ought*. He also points out that when we remove *only* from (i) we have to use *may* instead of *can*:

iv. a. ??John can be at work.
b. John may be at work.

It seems that to express epistemic possibility, *may* is preferred, but *can* is used when there is negation or *only* around.

28 See McCawley (1993: 311f) and Horn (1996: 10ff) for further discussion of this point.

29 The observation is due to Horn (1996: 28). The example in (53b) was given to me by Jim McCawley (p.c.).

30 In an appendix, Horn (1996) discusses some of these data and suggests that NPI-licensing here is based on speakers' confusion: somehow the downward monotonicity of *only*'s second argument is illicitly extended to its first argument. An explanation based on the assumption of a generic prejacent is clearly preferable.

31 As Paul Portner (p.c.) pointed out me, I have to exclude the possibility that the NPIs here are licensed by a generic operator above *only*. Otherwise, these data do not argue for a generic prejacent under *only*. The argument here depends on an observation due to Linebarger (1980, 1987): NPIs are only licensed locally. The mere presence of a licensing operator somewhere above the NPI is not enough. For example, *#Every boy has any potatoes* doesn't get any better when embedded under negation: *#It's not true that every boy ate any potatoes.* Conversely, *Not every boy who had any potatoes ate them* is okay because *every* licenses NPIs in its first argument, even though the presence of the higher negation will eventually destroy the downward monotonicity in the first argument of *every*. Thus, in the examples in the text, it can only be a generic operator in the scope of *only* that can license the NPIs.

32 Two pieces of a complete analysis would have to be (i) Laka's work on the syntactic elements that manipulate the truth polarity, especially her hypothesis of a Σ-phrase (Laka 1990), (ii) Höhle's work on 'verum focus' (Höhle 1992).

33 One of the reviewers pointed out that Höhle's analysis may help here as well. Höhle suggests that verum focus is signalled by destressing constituents which have semantic content. This may leave stress on *if*, which according to Kratzer of course has little semantic content.

34 Thanks to Jim McCawley (p.c.) for help with these examples.

35 However, I have to report an example, due to Maribel Romero, that is somewhat troubling from my perspective:

i. Only if at least one man with BLUE eyes is among your ten guests will I come to your party.

In spite of the apparent narrow focus on a deeply embedded constituent of the *if*-clause, we can only get the right meaning if we assume focus on the truth polarity of the antecedent. (i) clearly does NOT deny that the speaker will come to the party if there is at least one man with black eyes among the guests. Rather the claim is that the speaker will not come if there is not at least one man with blue eyes among the guests. This example thus can only be properly treated if the relevant alternatives are not signalled by the prominent pitch accent, but are computed in some other way. What we would have to hope is that we can reasonably claim that the pitch accent on *blue* is motivated by matters of discourse contrast and that there is some secondary focus that signals the alternatives relevant to the domain restriction of *only*.

36 Barker (1993) also reaches the conclusion that the Excluded Middle is rather essential for an analysis of *only if*-conditionals. He remains skeptical about this move, however. He advocates an analysis where conditional sentences express conditional assertions, something that may be correct for certain kinds of speech acts, but can presumably not be generalized to all conditionals that can combine with *only*. His proposal also does not extend naturally to cover the generic *only*-sentences that I see as posing the very same semantic puzzle.

37 Note that it is well known from the study of the semantics of plurals that for *The students are playing* to be true they don't all have to be playing, 'as long as they're behaving as some sort of coherent group engaged in a play activity (maybe one of them is keeping score and another one is keeping watch for bullies, etc.)' (Jim McCawley, p.c.). This phenomenon is discussed most recently by Brisson (1997).

38 Another author who argues for something like a homogeneity presupposition is Schwarzschild (1994), although his system is different from what we are doing here. Barker (1996) also postulates a 'homogeneity presupposition', but it is not at all the same condition I am using. It has to do with a solution to the proportion problem.

39 See Horn (1989) for extensive discussion of meta-linguistic negation. The data here differ from more run-of-the-mill cases of meta-linguistic negation in that in those it isn't negation that is focussed, as pointed out to me by a reviewer. However, note that what should be focussed in my examples would be the generic quantifier, which of course can't be focussed since it is silent. So perhaps stress shifts to negation as some kind of default.

40 See also Yoon (1996).

41 In the paper on conditionals, I give references to other work which has pursued similar ideas. See especially McCawley (1993: Chapter 15, 1996).

42 For treatments of *even if*-conditionals, see the series of relevant papers in L&P (Bennett 1982; Barker 1991, 1994; Lycan 1991). Here, I cannot discuss these proposals and the way they would help in spelling out the pragmatic story about Contraposition. Maybe I'll have a chance of doing that on some other occasion.

43 Other authors that want to maintain the validity of Contraposition are Hunter (1993) and Urbach (1988).

44 This example is from Barker (1993), who writes that the *only*-sentence 'is perhaps a little cumbersome, but perfectly intelligible'.

45 It would be nice to conduct a corpus search and see whether there are real-life examples of this kind.

46 A completely unrelated aside: note the interesting problem this sentence poses for the analysis of superlatives.

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