How Does Focus Affect Logical Form?

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1 Focus and Logical Form

It is well known that focus can affect the truth conditions of some sentences—in this paper I will concentrate on adverbs of quantification (henceforth *Q-adverbs*). Hence, focus somehow affects logical form.[1] People often say, almost by way of a slogan, "Focus goes to the nuclear scope, background goes to the restrictor." But what does this mean, exactly?

To illustrate the problem, consider (1).

(1)   A dog is usually [intelligent]$_F$.

Rooth (1995) identifies two possibilities for its logical form.

One possibility is that focus determines which elements in the sentence are mapped onto the nuclear scope, and which—onto the restrictor. Consider a typical implementation of this view (Chierchia 1995)). At some level of representation, the nuclear scope contains the entire sentence (minus the Q-adverb). Then, non-focused material moves out of the nuclear scope into the restrictor. Chierchia represents the result as follows (cf. Heim 1982):

(2) $\underbrace{[_{XP}NP_1, \dots, NP_n}_{\text{restrictor}}$ Q-ADV $\underbrace{XP_s]}_{\text{nuclear scope}}$

Note that non-focused elements are moved, not copied; hence, a surface element can be mapped onto the restrictor or the nuclear scope, but not both.

Since in (1) focus is on *intelligent*, *a dog* would be moved into the the restrictor, and the resulting logical form (1) would be (3).[2]

(3)   **usually**(**dog**)(**intelligent**)

According to this view, there is little left in the nuclear scope—essentially, only the focus. I will therefore call it the *stingy* nuclear scope.

A different view is that the nuclear scope contains the entire sentence (without the Q-adverb), and does not lose any material. Its effect on interpretation is

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[1]Actually, there are good reasons to believe it is not really focus as such, but the presupposition it gives rise to which affects logical form (Cohen 1999b; Rooth 1999; Krifka 2001); but I will leave this issue aside for the purposes of this paper.

[2]I use simplified logical forms, where I omit reference to the variables quantified by the Q-adverb, so as not to get into the issue of what sort of things these variables are (e.g. situations, cases). This is a very interesting question, but it lies outside the scope of this paper.

to provide a set of alternatives, the focus semantic value, whose union is accommodated into the restrictor (Rooth 1985). In the case of (1), the focus semantic value of the nuclear scope would be:

(4) $[\![\mathbf{dog} \wedge [\mathbf{intelligent}]_F]\!]^F = \{\mathbf{dog} \cap \mathbf{intelligent},$
                $\mathbf{dog} \cap \mathbf{stupid},$
                $\mathbf{dog} \cap \cdots\}.$

Its union will be

(5) $\bigcup [\![\mathbf{dog} \wedge [\mathbf{intelligent}]_F]\!]^F = \mathbf{dog},$

and if we accommodate it into the restrictor, we get (6) as the logical form of (1).

(6) $\mathbf{usually}(\mathbf{dog})(\mathbf{dog} \wedge \mathbf{intelligent})$

Since, according to this view, the nuclear scope contains the entire sentence, I will call this a *generous* nuclear scope.

Which nuclear scope shall we choose—stingy or generous? It is not often realized, but the two views are quite significantly different. Choosing one or the other has empirical as well as theoretical consequences. In this paper I am going to argue for the generous view, and demonstrate how it can cope with a new problem for theories of focus effects—*relative readings*.

2   A Problem with the Stingy Logical Form

The first question that comes to mind is, of course: does it matter which logical form we choose? I claim that it does. One consideration is theoretical. According to the view that nuclear scope is stingy, focus moves elements around the logical form. In addition, there is sufficient independent evidence that focus introduces a set of alternatives. Hence, one would be forced to the conclusion that focus has two, unrelated roles: causing movement and introducing alternatives. This is hardly an appealing conclusion.

Proponents of the stingy logical form could claim that focus has only a single role (introducing alternatives), and that it is topic that is responsible for moving elements out of the nuclear scope. In order for this claim to be meaningful, of course, one needs a definition of topic that is independent of focus. I will follow the view that topic is what the sentence is about, hence it must denote an entity (Reinhart 1981; Erteschik-Shir 1997; Portner and Yabushita 1998).

Now we can consider the following question: how would Q-adverbs behave if they were topic-dependent, rather than focus-dependent? It turns out there is a construction that is, in fact, topic-dependent, but it contrasts in its properties with Q-adverbs: generics. People often assume that a generic is just a phonologically null Q-adverb, but there are, in fact, quite a few significant differences between the two constructions (see Cohen 1999a for some of them). One such difference that is relevant here is the fact that generics require topics, hence cannot have scope over topicless clauses, whereas Q-adverbs require focus, hence cannot have scope over focusless clauses. Let us substantiate each one of these claims in turn.

2.1 Topicless Clauses

As (1) and (7) demonstrate, indefinites can be in the restrictor of a Q-adverb.

(7)   A shark is usually harmless.

But then the idea that topics are moved into the restrictor meets an immediate problem, since *a dog*, being indefinite, is not specific, hence cannot be a topic. If forced to be a topic, the result is ungrammatical:

(8)   *She said about a shark that it is usually harmless (after Reinhart 1981).

The behavior of Q-adverbs can be contrasted with that of (unrestricted) generics, which do require topics. Hence, (9) is rather bad.

(9)   *A shark is harmless.

Putative cases of generics that do allow an indefinite in their restrictor are either restricted generics (as in (10.a)), or sentences expressing a rule or definition (as in (10.b)), rather than real generics (Cohen 2001a).

(10) a.   A shark is harmless when it is small.

     b.   A shark has a favorite hunting area.

One way to see that sentences like (10.b) are not really generic is by examining their scopal possibilities. The real generic (11) is ambiguous: it can mean either that each shark has its own favorite hunting area, or that there is one hunting area favored by all sharks.

(11)   Sharks have a favorite hunting area.

In contrast, (10.b) only has the first reading, namely that different sharks have possibly different hunting areas.

Hence, we can conclude that Q-adverbs do not require topics, whereas unrestricted generics do.

2.2 Focusless Clauses

What would a focusless clause be like? This depends on our definition of focus. If we simply take it to be "new information", then presumably (almost) no clauses are focusless, since every clause is supposed to add *some* new information (otherwise why say it?). I will therefore be concerned with what has been called narrow, identificational (Kiss 1998), or restrictive (Erteschik-Shir 1997) focus: the element (or elements) of a sentence that induces alternatives and may be associated with focus-sensitive particles.

Then, clearly, not all clauses ought to have this kind of focus. Consider (12), for example.

(12)   Only [mammals]$_F$ bear live young.

Sentence (12) is false. Normally, saying that only ϕ means that no alternative to ϕ is true. Since (12) is false, we would expect at least one of the following alternative generics to be true:

(13) a. Birds bear live young.

    b. Reptiles bear live young.

    c. Fish bear live young.

    d. . . .

However, while some fish and some reptiles do bear live young, none of the generics in (13) are true.Yet, the mere fact that there exist *some* non-mammals that bear live young, appears to be sufficient to render (12) false.

In Cohen (forthcoming) I propose to solve this problem in the following way. The interpretation of (14.a) is roughly (14.b).

(14) a. Mammals bear live young.

    b. If **mammal**$\cap\bigcup$ ⟦**bear-live-young**⟧^{F}, then, in general, **bear-live-young**.

In (12), focus associates with *only*, not the generic. Therefore, the generic has scope over a focusless clause. The relevant focus semantic value is consequently a singleton:

(15)   ⟦**bear-live-young**⟧^{F} = {**bear-live-young**}.

Therefore,

(16) $\bigcup$ ⟦**bear-live-young**⟧^{F} = **bear-live-young**,

and (14.a) is true iff

(17)   If **mammal** $\cap$ **bear-live-young**, then, in general, **bear-live-young**.

This will be true iff *some* mammals bear live young. Hence, (12) means (18), as desired.

(18)   Mammals are the only class of animals *some* of which bear live young.

Therefore, we can conclude generics do not require focus.

In contrast, using a Q-adverb such as *usually* or *generally* does not have the same effect: (19.a) can only mean (19.b), never (19.c).

(19) a. Only [mammals]$_F$ usually/generally bear live young.

    b. Mammals are the only class of animals which generally/usually bear live young.

    c. Mammals are the only class of animals some of which bear live young.

Hence, Q-adverbs cannot apply to a focusless clause, and require focus. If the focused *mammals* associates with *only*, there must be second occurrence focus on an additional element of the sentence—in this case, *bear live young*.

We can conclude that it is, indeed, focus, rather than topic, which determines the logical form of Q-adverbs. Consequently, proponents of the stingy logical form would be forced to the unattractive position of having to postulate two different roles for focus. We should therefore turn to the alternative, namely that nuclear scope is generous.

3   A Problem with the Generous Logical Form

The view that logical form is generous also suffers from a problem: the *requantification problem* (Rooth 1995; von Fintel 1994). A generous logical form such as (6) contains two occurrences of the translation of the indefinite *a dog*. Now, indefinites are expected to be novel (Heim 1982); however, the second occurrence of the indefinite must refer to the first occurrence, and cannot be novel; otherwise, the sentence would get the wrong interpretation where most dogs are such that some dog is intelligent.

By way of a solution, Rooth (1995) considers doing away with the novelty condition, but admits that this is problematic. For example, without the novelty condition we would wrongly predict(20) to be good.

(20)   *[NP A man]3 walked in. [NP A man]3 sat down.

One may suggest a prohibition against the coindexing of indefinites, but this will not solve the problem. Besides being stipulative, Rooth points out that there are cases where we do want to allow coindexing of indefinites; for example (21), under the reading where the pronoun can refer either to the yacht John sails or to the plane John flies.

(21)   When John sails [NP a yacht]3 or flies [NP a plane]3, he always wrecks [NP it]3.

Krifka (2001) proposes a better solution to this problem: he develops a theory which maintains the novelty condition, but only for some indefinites. In particular, deaccented indefinites, like the subject in (1), are not novel, hence the acceptability of the sentence.

4   A New Challenge for Generous Logical Forms

4.1   Conservativity

It turns out, however, there is a new challenge for the view that nuclear scope is generous. To see the problem, consider a sentence whose nuclear scope is unquestionably generous:

(22) a.   A dog is usually an [intelligent]$_F$ dog.

     b.   **usually**(**dog**)(**dog** $\wedge$ **intelligent**)

Since we assume that (1) has a generous nuclear scope too, (1) and (22.a) ought to be equivalent.

At first sight, this does not appear to be a problem, and even seems to be a desirable consequence. Indeed, if Q-adverbs are conservative, we would expect exactly this equivalence.

A quantifier Q is conservative iff

(23) $Q(\psi, \phi) \equiv Q(\psi, \psi \wedge \phi)$.

Thus, for example, (24.a) is equivalent to (24.b).

(24) a.   Most/all/no/some alligators like to sunbathe.

b.   Most/all/no/some alligators are alligators that like to sunbathe.

Another way to think about conservativity is that when we evaluate the truth of (24.a), we only care about alligators; non-alligators and their property do not matter at all.

Clearly, if Q-adverbs are conservative, (1) and (22.a) are equivalent. However, it turns out there are non-conservative readings of Q-adverbs.

4.2   Relative Readings

Consider the following sentence:

(25)   Paul often has a headache.

De Swart (1991) notes that (25) is ambiguous.[3] Under one reading, it means that

> in many appropriate situations Paul has a headache... But this is not the only way to read [(25)]. The sentence can also be taken to mean that the situations of Paul having a headache occur with a frequency superior to the average (p. 21)

Note that under the second reading, Paul can heave a headache quite infrequently, say once a month, so long as the average frequency in his comparison group is lower.

Here is another sentence exemplifying the same kind of ambiguity:

(26)   A politician is often crooked.

Note that (26) is ambiguous. One reading of (26) is that many politicians are crooked, i.e. a politician is likely to be crooked. Under this, which I call the *absolute* reading, (26) is (hopefully) false. And yet, one may hesitate before declaring (26) unequivocally false, because there is another reading, under which the sentence is probably true. Under this, the *relative* reading, a politician is more likely to be crooked than an arbitrary person is. In other words, suppose we pick some person at random. There is some probability p that this person is crooked; what (26) says is that if we pick a politician at random, the probability that he or she is crooked is higher than p.

Context and a fall-rise intonation (B-accent) are helpful, perhaps necessary, for obtaining this reading. Imagine two detectives having the following conversation:[4]

(27)   Q: The main suspects are a politician, a physician, and a linguist. Who
       do you think did it?
       A: Well, [a politician]$_B$ is often crooked.

One might suggest that what we are dealing with here is not a case of real ambiguity, but a consequence of the vagueness of *often*. Perhaps, since what counts as *often* is not well defined, what I call the relative reading is simply a default strategy for obtaining a value defining how often is *often*, in cases the context does not provide a better value. However, there are reasons to believe this is not the case.

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[3]Her account of the ambiguity, however, is different from the one I propose here.
[4]The B feature indicates a fall-rise intonation. More on this below.

One argument is that, in general, relative readings are not easy to get, and actually do appear to require special contexts to make them salient. This is not to be expected if relative readings were a default strategy employed when there is insufficient context.

Another argument for ambiguity is simple: as we have seen, (26) can be true under one reading and false under the other.

For an additional argument, note that generics, which are not usually considered vague, also exhibit this ambiguity (Cohen 1996).

A stronger argument is based on the fact that the relative reading is not available when the adverb is fronted:

(28)   Often, a politician is crooked.

Sentence (28) can only get the absolute reading, namely that many politicians are crooked, but not the relative reading. Fronting is known to eliminate ambiguities (e.g. some cases of scope ambiguity), but not to eliminate vagueness.

Perhaps the strongest argument, and the one most relevant for our purposes here, is the fact that the relative reading is not conservative. Sentence (29) is not equivalent to (26) and can, in fact, only get the absolute reading.

(29)   A politician is often a crooked politician.

This is perhaps not so surprising: *often* is related to *many*, and the conservativity of *many* is at best problematic (Westerståhl 1985; Cohen 2001b).

So, (26) and (29) are not equivalent; and since (29) must have a generous logical form, it would seem that (26) cannot.

5   Types of Semantic Value

Before facing up to challenge, let us arm ourselves with the proper tools. In this case, an enriched system of types of semantic value will turn out to be useful.

5.1   Focus Semantic Value

The simplest type of semantic value of an expression ϕ, the ordinary semantic value $[\![\phi]\!]^O$, is just its denotation. Rooth (1985) has suggested that, in addition to the ordinary semantic value there is also a *focus semantic value*. This value, written $[\![\phi]\!]^F$, is a set of expressions of the type of ϕ, obtained by replacing the focused constituent(s) with alternatives.[5]

According to Rooth, the restrictor of a Q-adverb contains a variable, so the logical form of a sentence with the Q-adverb Q is

(30) $Q(C)(\phi)$.

The union (disjunction) of the focus semantic value is accommodated into the restrictor:

(31) $C = \bigcup [\![\phi]\!]^F$.

To take a classic example, consider (32).

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[5]See Cohen (1999b) for a more thorough description of the way in which alternatives are computed.

(32)   Mary always takes [John]$_F$ to the movies.

Its logical form is

(33)   **always**(C)(**take-to-movies**(**m, j**)).

The focus semantic value is

(34) $[\![$**take-to-movies**$(\mathbf{m}, [\mathbf{j}]_F)]\!]^F = \{$**take-to-movies**$(\mathbf{m}, \mathbf{j})$,
                                        take-to-movies$(\mathbf{m}, \mathbf{f})$,
                                        take-to-movies$(\mathbf{m}, \mathbf{b}) \ldots\}$

Its union is assigned to the variable in the restrictor:

(35) $C = \bigcup [\![$**take-to-movies**$(\mathbf{m}, [\mathbf{j}]_F)]\!]^F =$
        $\exists x$**take-to-movies**$(\mathbf{m}, x)$

The result can be paraphrased as (36), which arguably is the right interpretation of (32)

(36)   Always, when Mary takes someone to the movies, she takes John to the movies.

5.2 Contrast Semantic Value

Recall that marking the subject with a B-accent facilitates the relative reading. I will assume a feature B, which, like focus, may mark any expression.

B-marked elements are sometimes called contrastive topics. They are not really topics, however, since they are not specific. Moreover, while topics normally take wide scope, B-accented elements take narrow scope (cf. Portner and Yabushita 1998).

(37) a.   John didn't see a spot.
      b.   As for a spot, John didn't see it.
      c.   [A spot]$_B$, John didn't see.

Sentence (37.a) is scopally ambiguous: either the indefinites takes narrow scope with respect to negation, resulting in the reading where John didn't see any spot; or the indefinite takes wide scope, meaning that there was a spot that he missed. When *a spot* is topicalized, as in (37.b), we only get the wide scope interpretation of the indefinite; in contrast, when the indefinite is B-marked, as in (37.c), we only get the narrow scope reading.

Although B-accented elements are not topics, they are, indeed, contrastive. Following Büring (1997, 1999), I will suggest an additional semantic value, which makes use of the B-feature. Let us call it the *contrast* semantic value.[6] Written as $[\![\phi]\!]^C$, it is a set of sets of propositions. In each set there is a different alternative for the B-marked element. All propositions in a set share this alternative, but vary with respect to the focus.

For example:

(38) $[\![[\text{John}]_B \text{ loves } [\text{Mary}]_F]\!]^C = \{\{\text{John loves Mary}, \text{John loves Kate}, \ldots\}$
                                        $\{\text{Fred loves Mary}, \text{Fred loves Kate}, \ldots\}$
                                        $\ldots\}$

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[6]Büring calls it the topic semantic value.

Note that, making the standard assumption that the meaning of a question is a set of propositions (Hamblin 1973), this can be interpreted as the following set of questions:

(39) {Whom does John love?, Whom does Fred love?,... }

Büring suggests that a question-answer dialog is felicitous if the question is a member of the contrast semantic value of the answer.

Note that the union of the contrast semantic value is the same type as the focus semantic value, and it is obtained by replacing both F-marked and B-marked constituents with alternatives

(40) $\bigcup [\![[\text{John}]_B \text{ loves } [\text{Mary}]_F]\!]^C = \{$John loves Mary, John loves Kate, Fred loves Mary, Fred loves Kate, $\cdots\}$

5.3 B Semantic Value

Let us take stock. So far, we have three types of semantic value: the ordinary semantic value, which takes no alternatives into account; the focus semantic value, which considers alternatives to F, but not to B; and the contrast semantic value, which considers alternatives to both F and B. We can represent them as a table in the following way:

	alternatives to B	no alternatives to B
alternatives to F	$[\![\phi]\!]^C$	$[\![\phi]\!]^F$
no alternatives to F	?	$[\![\phi]\!]^O$

(41)

There is a gap in this table, namely a type of semantic value that considers alternatives to B but not to F. Let us fill this gap. We can propose a B semantic value, written $[\![\phi]\!]^B$, which is obtained by replacing B-marked constituents with alternatives For example:

(42) $[\![[\text{John}]_B \text{ loves } [\text{Mary}]_F]\!]^B = \{$John loves Mary, Fred loves Mary, ...$\}$

6 Generous Logical Form And Relative Readings

6.1 Explanation of Relative Readings

What is the explanation for relative readings? I would like to suggest the following, based on Cohen (2001b) and Sigrid Beck (pc).

Following Rooth (1985), absolute readings make use of the focus semantic value: its union is accommodated into the restrictor. Intuitively, this means that the restrictor abstracts away from the F-marked element. The nuclear scope contains the ordinary semantic value, which keeps the F-marked constituent as is.

We will follow the same idea in the definition of the relative reading: again, the nuclear scope will keep, and the restrictor will abstract away from, the F-marked element. However, both restrictor and nuclear scope will abstract away from the B-marked element.

This idea will be implemented by proposing probabilistic truth conditions for Q-adverbs, where $P(\alpha|\beta)$ is the conditional probability of α given β.[7] The truth conditions of *often* are defined as follows:

Definition 1 $\mathbf{often}(C)(\phi)$ *is true iff* $P(\llbracket\phi\rrbracket^{O}|\bigcup\llbracket\phi\rrbracket^{F}) > \rho$, *where:*

1. ρ *is "large" (absolute reading), or*

2. $\rho = P(\bigcup\llbracket\phi\rrbracket^{B}|\bigcup\bigcup\llbracket\phi\rrbracket^{C})$ *(relative reading).*

Similar definitions can be provided for *seldom, many, few*, generics. . .

Note that the definition of the absolute reading is completely standard: it makes use only of the ordinary and the focus semantic value. The relative reading, however, requires the B semantic value (which keeps the F-marked element) and the contrast semantic value (which abstracts away from it).[8]

To see how this definition works, consider the semantic values of the nuclear scope of the answer in (27), repeated below.

(43)   Q: The main suspects are a politician, a physician, and a linguist. Who do you think did it?
A: Well, a [politician]$_B$ is often crooked.

The ordinary semantic value is simply:

(44) $\llbracket\phi\rrbracket^{O} = \mathbf{politician} \cap \mathbf{crooked}$.

What about the focus semantic value? In order to answer this question, we need to establish where the semantically relevant focus is. Many informants prefer to stress the Q-adverb *often* itself in order to obtain the relevant reading. Since *a politician* is B-marked, this means that the contrast semantic value will correspond to the following set of questions:

(45)   {How likely is a politician to be crooked?, How likely is a physician to be crooked?, How likely is a linguist to be crooked?}

In this context it is clear that the detective asking the question (who is trying to identify the guilty party among the three suspects) is interested in an answer to each one of these questions, hence the felicity of the exchange.

However, since Q-adverbs require focus (see section 2 above), there must also be focus on *crooked*. If *often* is stressed, this will be a second occurrence focus, but second occurrence focus is the semantically relevant one, in the sense that it is the type of focus that associates with operators such as Q-adverbs.

Given that *crooked* is focused, the focus semantic value of the nuclear scope is

(46) $\llbracket\phi\rrbracket^{F} = \{\mathbf{politician} \cap \mathbf{crooked}, \mathbf{politician} \cap \mathbf{honest}\}$.

Its union, which is accommodated into the restrictor, is

(47) $\bigcup\llbracket\phi\rrbracket^{F} = \mathbf{politician}$

The B semantic value is

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[7]This is not strictly necessary here, however; the reader who is uncomfortable with probabilities may think of proportions instead.
[8]Compare Krifka 1999, where additives associate with contrastive topic.

(48) $\llbracket \phi \rrbracket^B = \{$**politician** $\cap$ **crooked**,
            physician $\cap$ **crooked**,
            linguist $\cap$ **crooked**$\}$

Its union is:

(49) $\bigcup \llbracket \phi \rrbracket^B =$ **crooked**.

The contrast semantic value is:

(50) $\llbracket \phi \rrbracket^C = \{\{$**politician** $\cap$ **crooked**, **politician** $\cap$ **honest**$\}$,
            $\{$**physician** $\cap$ **crooked**, **physician** $\cap$ **honest**$\}$,
            $\{$**linguist** $\cap$ **crooked**, **linguist** $\cap$ **honest**$\}\}$

Its double union is:

(51) $\bigcup\bigcup \llbracket \phi \rrbracket^C =$ **person**

The derivation of the absolute reading is standard (following Rooth), using only the focus semantic value. The Derivation of the relative reading is more interesting. **often**$(C)(\phi)$ is true iff

(52) $P(\llbracket \phi \rrbracket^O | \bigcup \llbracket \phi \rrbracket^F) > P(\bigcup \llbracket \phi \rrbracket^B | \bigcup\bigcup \llbracket \phi \rrbracket^C)$.

Plugging the semantic value calculated above, we get:

(53) $P(\textbf{politician} \cap \textbf{crooked} | \textbf{politician}) > P(\textbf{crooked} | \textbf{person})$.

This can be paraphrased by (54), as desired.

(54)   A politician is more likely to be a crooked politician then an arbitrary person is likely to be crooked.

Crucially, both readings share the same logical form (Cohen 2000). There are two arguments for this claim. One comes from parsimony: even if we assumed different logical forms, we would still need different values for ρ; so what is the point of assuming two logical forms, if they do not provide us with two different readings?

The second argument is the observation that both absolute and relative readings have the same focus (possibly as second occurrence); when focus, rather than B-accent, is on the subject, the meaning is different:

(55) ??[A politician]$_F$ is often crooked.

Sentence (55) is quite bad; and even informants who accept it, get an interpretation very different from either reading of (26), namely that a crooked person is likely to be a politician. Assuming that, indeed, focus affects logical form, this is an indication that both readings have the same logical form.

6.2   Conservativity Revisited

We can now explain why (56.a) is not equivalent to (56.b).

(56)   a.   [A politician]$_B$ is often [crooked]$_F$.

       b.   [A politician]$_B$ is often a [crooked]$_F$ politician.

The respective logical forms of (56.a) and (56.b) are:

(57) a. $\mathbf{often}(C)([\mathbf{politician}]_B \wedge [\mathbf{crooked}]_F)$

  b. $\mathbf{often}(C)([\mathbf{politician}]_B \wedge \mathbf{politician} \wedge [\mathbf{crooked}]_F)$

Their ordinary semantic values are the same, but not the B and contrast semantic values. Consequently, while (57.a) has a relative reading, (57.b) does not, for the following reason. The ordinary semantic value is:

(58) $[\![\phi]\!]^O = \mathbf{politician} \cap \mathbf{crooked}$.

The value accommodated into the restrictor is:

(59) $C = \bigcup [\![\phi]\!]^F = \mathbf{politician}$.

Since only one occurrence of **politician** is B-marked, the union of the B semantic value is:

(60) $\bigcup [\![\phi]\!]^B = \mathbf{politician} \cap \mathbf{crooked}$,

and the union of the union of the contrast semantic value is:

(61) $\bigcup\bigcup [\![\phi]\!]^C = \mathbf{politician}$.

Hence, (57.b) is true iff

(62) $P([\![\phi]\!]^O | \bigcup [\![\phi]\!]^F) > P(\bigcup [\![\phi]\!]^B | \bigcup\bigcup [\![\phi]\!]^C)$.

Using the calculated values, we get:

(63) $P(\mathbf{politician} \cap \mathbf{crooked} | \mathbf{politician}) >$
    $P(\mathbf{politician} \cap \mathbf{crooked} | \mathbf{politician})$.

Since a number is never strictly greater than itself, this is necessary false—certainly not the intended relative reading.

6.3 Fronting

A similar account explains why (28) does not have a relative reading. Dealing with the syntax of fronting a Q-adverb, and whether there really is any movement involved, lies outside the scope of this paper. Intonationally, the fronted Q-adverb seems to bear a fall-rise, B-accent intonation. Taking this intonation contour seriously, I suggest that fronting the Q-adverb B-marks it, and eliminates the B-marking of all elements in its scope. In particular, *a politician* is no longer B-marked. Thus, the B and contrast semantic values contain the predicate **politician**, and do not replace it with alternatives. This is different from the B and contrast semantic values of (26), which do contain alternatives to **politician**, allowing us to compare politicians with persons in general, resulting in the relative reading.

  More technically, the logical form of (28) is:

(64) $\mathbf{often}(C)(\mathbf{politician} \wedge [\mathbf{crooked}]_F)$.

The ordinary semantic value of the nuclear scope is:

(65) $[\![\phi]\!]^O = \mathbf{politician} \cap \mathbf{crooked}$.

The union of the focus semantic value is accommodated into the restrictor:

(66) $C = \bigcup \llbracket \phi \rrbracket^F = \textbf{politician}$.

The union of the B-semantic value is:

(67) $\bigcup \llbracket \phi \rrbracket^B = \textbf{politician} \cap \textbf{crooked}$,

and the union of the union of the contrast semantic value is:

(68) $\bigcup \bigcup \llbracket \phi \rrbracket^C = \textbf{politician}$.

Then $\textbf{often}(C)(\phi)$ is true iff

(69) $P(\llbracket \phi \rrbracket^O | \bigcup \llbracket \phi \rrbracket^F) > P(\bigcup \llbracket \phi \rrbracket^B | \bigcup \bigcup \llbracket \phi \rrbracket^C)$,

which comes down to

(70) $P(\textbf{politician} \cap \textbf{crooked}|\textbf{politician}) >$
        $P(\textbf{politician} \cap \textbf{crooked}|\textbf{politician})$. Again, since a number is never
        strictly greater than itself, this is necessary false—the wrong reading.

6.4   Other Q-adverbs

Not all Q-adverbs have relative readings. For example, (71) means that a politician is likely to be crooked. Regardless of context or intonation, it cannot mean that a politician is more likely to be crooked than an arbitrary person is.

(71)   [A politician]$_B$ is usually [crooked]$_F$.

Can we, then, apply the results about the logical form of *often* (and *seldom*) to other Q-adverbs? Indeed, we can. Otherwise, we would be forced to the implausible conclusion that focus creates different logical forms depending on the specific Q-adverb involved. This would mean that a general linguistic device—focus—behaves differently, and creates different logical forms, depending on the lexical entry for the Q-adverb involved.

It is much more plausible to conclude that *all* Q-adverbs have a generous logical form. Some Q-adverbs (*often* and *seldom*) are simply lexically ambiguous, others are not.

7   Derivation of Logical Form

If the theory presented here is on the right track, it has an interesting consequence: the respective logical forms of Q-adverbs and generics are derived in different ways. Consider Q-adverbs first, with (72) as an example.

(72)   A dog is always [intelligent]$_F$

The following stages can be identified in the derivation of the logical form. First, the hearer creates a tripartite structure, mapping the entire sentence (minus the Q-adverb) onto the nuclear scope, and leaving a variable in the restrictor. The result is:

(73) **always**(C)(**dog** ∧ **intelligent**).

Then, the hearer must identify the the focused element(s); this is why Q-adverbs require focus. In this case, the focused element is:

(74) **intelligent**.

The next step involves accommodating the union of the focus semantic value into the restrictor:

(75) **always**(**dog**)(**dog** ∧ **intelligent**).

Finally, the sentence is evaluated, based on the lexical entry for the Q-adverb
    The story is different in the case of generics, exemplified by (76).

(76) Dogs are intelligent

The first step here is to create a predicational structure. We have said that the topic is what the sentence is about, hence the topic must be the argument of predication; this is why generics require a topic. Thus, the initial logical form if (9) is:

(77) **intelligent**(↑**dog**).

However, this logical form does not make sense; the kind ↑**dog** is not the sort of thing that can be intelligent—only individual dogs can. Hence, the hearer infers the generic quantifier, and maps the argument onto the restrictor (after appropriate type-shifting):

(78) **gen**(**dog**)(**intelligent**).

It is important to note that, unlike Q-adverbs, the generic quantifier is not present in the input to the hearer, and is only inferred in case of an unacceptable interpretation. By this time, however, the logical form is fully specified (with the argument mapped onto the restrictor, the predicate onto the nuclear scope), hence generics do not require focus. Of course, focus *can* be present, although it does not have to be; in this case, the union of the focus semantic value is accommodated into the restrictor.

The last stage is to evaluate the generic, based on the evaluation rule for generics. There are many views on what this rule is—see Cohen 1996 for my own suggestion.

8 Conclusion

We conclude that Q-adverbs have a generous logical form. Hence, focus has one role only: it provides a set of alternatives, which is accommodated into the restrictor. B-marking also provides a set of alternatives, which plays a role in the evaluation of some Q-adverbs (*often* and *seldom*, and their synonyms), to generate their relative readings. The generous logical form provides the right truth conditions in all cases, including these non-conservative Q-adverbs. This is because the logical form does not determine truth conditions by itself: the B and contrast semantic values are also relevant.

Topic also plays a role, not in quantificational structure, but in predicational ones. Generics are primarily predicational, and become quantificational only

when the predication is unacceptable. Hence, generics require topic, but don't require focus. Q-adverbs are directly quantificational, hence require focus, but don't require topic.

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