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On Certain Differences between *Wh*-phrases and  
Indefinites\*

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§0 In Berman (1989a,b) I presented an analysis of indirect questions that drew on parallel behavior between *wh*-phrases and indefinites; I showed that *wh*-phrases, like indefinites, display variable quantificational force, and developed an analysis to account for this. I would like to extend this work now, by looking at the other side of the coin, that is, differences in the quantificational behavior of the two types of phrases. First, however, I will briefly review my analysis of their similarities.

§1 In the sentence in (1), the indefinite NP can have the quantificational force of the accompanying adverb:

(1) A conscientious scholar seldom engages in plagiarism.

That is, (1) can mean that few conscientious scholars are disposed towards plagiarizing. This follows straightforwardly on the Lewis/Kamp/Heim theory, according to which indefinites contain an essential free variable. On this account, the logical translation of (1) is roughly as in (2), where the first bracketed clause constitutes the restriction on the quantifier, that, the conditions

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that must be satisfied in order to appropriately evaluate the main clause, or, as Heim terms it, the nuclear scope of the quantifier.

(2) FEW( $x$ ) [conscientious-scholar'( $x$ )] [engage-in-plagiarism( $x$ )]

Thus, (2) will be evaluated as true iff few values assigned to  $x$  that verify that  $x$  is a conscientious scholar also verify that  $x$  engages in plagiarism. Now consider the sentences in (3):

- (3)a. Prof Jones usually finds out which students have cheated on the exam.
- b. Sue mostly remembers what gifts she got for her birthday.
- c. Bill acknowledged only in part which colleagues he got his examples from.
- d. With few exceptions, Mary knows which students submitted which abstracts to which conferences.
- e. John discovered which books were stolen.

The *wh*-phrases here can all be understood as having the quantificational force of the adverb or adverbial phrase in the sentence. For example, (3.a) can mean that for most students who have cheated on the exam, Prof Jones finds out of them that they have cheated on the exam. The suggestive conclusion is that *wh*-phrases, too, contain an essential free variable; thus the translation of (3.a) will be roughly as in (4):

(4) MOST( $x$ ) [student'( $x$ ) & cheated-on-the exam'( $x$ )]  
[find-out'( $p_j$ ), student'( $x$ ) & cheated-on-the exam'( $x$ )]

(3.d) illustrates that a single adverb can quantify more than one *wh*-phrase in its scope, something that Lewis demonstrated for indefinites. In (3.e) there is no explicit adverb of quantification; yet the *wh*-phrase is understood to have universal force--that is, for all books that were stolen, John discovered that they were stolen. I assume, again following Lewis, Kamp, and Heim, that in such a case there is an implicit universal quantifier supplied in logical form.

One of the main points of my analysis was to provide a systematic derivation of the restrictive term of quantified sentences involving *wh*-phrases. What I showed is that this is a presupposition of the sentence as a whole, and I appealed to the general process of presupposition

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accommodation to get the quantifier restriction. Evidence for this comes from comparing sentences such as those in (5) with those in (3):

- (5)a. Prof Jones usually wonders which students have cheated on the exam.
- b. Sue seldom asks what she is getting for her birthday.
- c. Bill almost never inquires as to which colleagues agree with his examples.
- d. Mary often imagines which abstracts are accepted for which conference.

The *wh*-phrases in (5) do not have the quantificational force of the accompanying adverbs, which can only be read as frequency adverbs. Now, the key difference between the verbs in (3) and those in (5) is that the former are factive, while the latter are nonfactive. As is well known, factive verbs presuppose their complement, but nonfactive verbs do not. Thus, as a result of presupposition accommodation, the indirect questions in (3), but not those in (5), become part of the restrictive term. This is why the *wh*-phrases in (5) are not quantified by the adverb.<sup>1</sup>

§2 Now that I've laid out the basic motivation for analysing both indefinites and *wh*-phrases as containing an essential free variable, I'll turn to the distributional differences in their ability to be quantified. To begin with, consider the sentences in (6) through (8):

- (6)a. The maître d' at Maxim's seldom remembers which regular customers tip big.
- b. The maître d' at Maxim's seldom remembers that regular customers tip big.
- (7)a. The maître d' at Maxim's remembers which regular customers seldom tip big.
- b. The maître d' at Maxim's remembers that regular customers seldom tip big.

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<sup>1</sup>Asher (1987), working within the framework of Kamp (1981), appeals to presupposition accommodation to distinguish between the representations of factives and nonfactives, though he is concerned with anaphoric relations, not with quantifiability, and thus draws no conclusions regarding the relation between presupposition accommodation and the restrictive term.

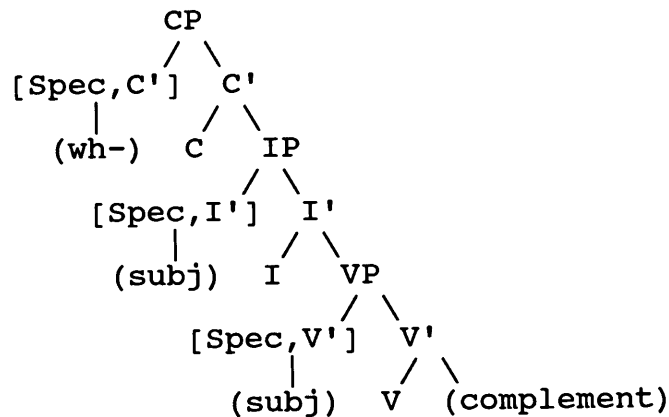
- (8)a. Which regular customers seldom tip big?  
 b. Regular customers seldom tip big.

On salient readings, the quantificational behavior of the *wh*-phrases and indefinites in these sentences shows a perfect complementary distribution: in (6) the matrix adverb quantifies the *wh*-phrase but not the indefinite, which instead has universal or generic force; in (7), on the other hand, the embedded adverb does not quantify the *wh*-phrase, which has universal force, but does quantify the indefinite; and finally, the *wh*-phrase is not but the indefinite is quantified by the adverb in (8). Again, where the adverb cannot quantify over individuals it serves as a frequency adverb, quantifying over temporal intervals; thus (6.b) may be paraphrased as saying that all (or, as a rule) regular customers tip big and the *maitre d'* rarely remembers this, and (7.a), that the *maitre d'* remembers, of all regular customer who rarely tip big, that they rarely tip big. In (8), the *wh*-phrase has neither universal force nor the force of the adverb; instead, it seems to be interpreted simply as a free variable, not associated with any particular quantifier: the sentence is asking for the set of values for the NP *which regular customers* that have the property of rarely tipping big. This behavior is identical to that of the *wh*-phrases in the sentences in (5). The generalization that emerges from the data in (6)-(8) is that a *wh*-phrase (or more accurately, the variable translating it) cannot be bound from within its clause by an adverb of quantification, while (the variable translating) an indefinite in a *that*-clause can only be bound from within its clause by an adverb of quantification. I turn now to an account of this behavior.

§3 For concreteness, I embed my analysis within the theory of the mapping from syntactic structure to logical form developed by Molly Diesing. Diesing adopts the hypothesis that there are two base-generated subject positions, daughter of VP and daughter of IP. A schematic phrase-structure tree representing this is given in (9) on the next page, which also shows the daughter of CP landing site for *Wh*-movement. This structure permits a straightforward account of the observation that an indefinite subject is sometimes ambiguous between a reading where it has variable quantificational force, and one where it has existential force (Cf Milsark (1974), Carlson (1977)). The sentence in (10) is an example of this ambiguity.

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(9)

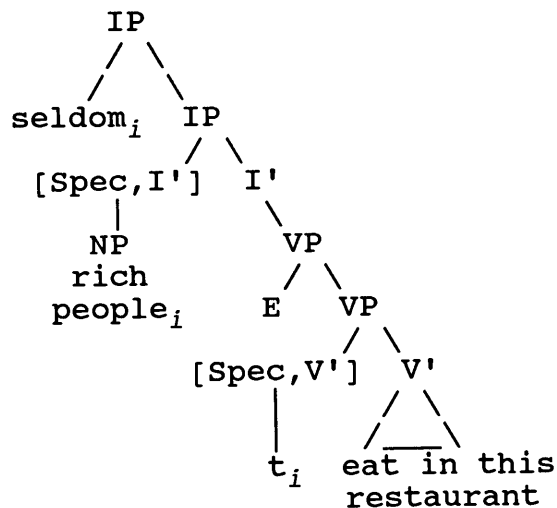


(10) Rich people seldom eat in this restaurant.

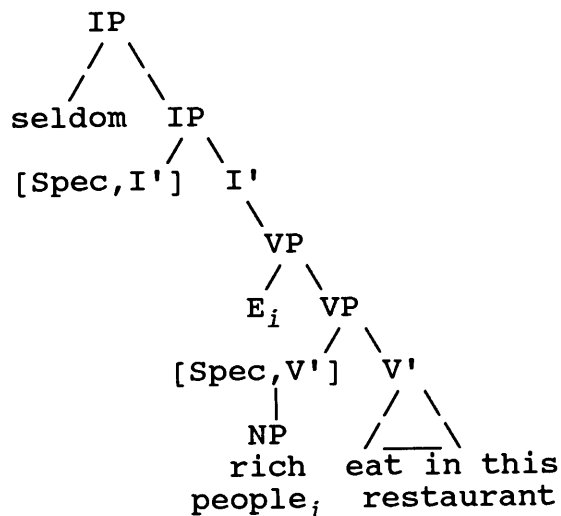
On the variable quantificational reading, (10) means that few rich people are in the habit of eating in this restaurant; on the existential reading it means that it is seldom that there are rich people eating in this restaurant. In terms of the Kamp/Heim analysis, this means that on the first reading the indefinite is in the restrictive term of the quantifier at LF, where it gets bound by the adverb of quantification; while on the second reading it is in the nuclear scope, where it gets bound by a default process of existential closure. As Diesing observed, this difference in logical form falls out of the structural representation in (9) if the VP subtree is mapped to the nuclear scope and the superordinate structure to the restrictive term. I assume that existential closure adjoins an existential quantifier to VP in LF; an adverb of quantification, being a sentential operator, is adjoined to IP. I assume for concreteness that the subject uniformly starts out in [Spec, V'] and then raises to [Spec, I'] at S-structure. Whether it stays in [Spec, I'] at LF or reconstructs back into [Spec, V'], that is, whether in a given sentence an indefinite has a variable or an existential reading, depends on properties of the predicate and the sentence as a whole that I can't go into here (see Kratzer (1989) for relevant discussion). As an illustration, the LFs for the two readings of the sentence in (10) are given in (12) on the next page, which yield the logical translations in (11).

- (11) a. FEW( $x$ ) [rich-person'( $x$ )] E [eat-in-this-restaurant'( $x$ )]  
 b. FEW [TIME( $t$ )] E( $x$ ) [rich-person'( $x$ ) & eat-in-this-restaurant'( $x, t$ )]

(12) a.



b.



In (11.b), the frequency reading of *seldom* is represented for simplicity in the form of restricted quantification, where TIME is a sortal predicate over temporal intervals (this is not meant to be a serious analysis of temporal quantification).

Why doesn't the variable  $x$  get bound by the existential in (11.a), since it is, after all, in its scope? Basically, the reason is that a quantifier selects the variables that it binds, and once a variable has been selected by one quantifier, it cannot be selected by another. The most complete formal implementation of this idea in the restricted quantifier framework that I am aware of appears in Irene Heim's dissertation, where two versions, a more syntactic and a more semantic one, are developed. For simplicity I adopt a modification, given

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in (13), of the syntactic version, which Heim calls Quantifier Indexing; the modifications include extending this rule to cover *wh*-phrases as well as indefinites, and to include nonquantifying variable-binding operators, which we will need later on.

(13) Operator Indexing

Copy the index of every phrase whose logical translation contains a free variable onto the lowest (in tree-theoretic terms) LF c-commanding variable-binding operator.

In addition, I employ the wellformedness condition in (14):

- (14) If a quantifier  $Q_1$  selects an index  $i$  and an  $i$ -indexed phrase also occurs in the scope of a quantifier  $Q_2 \neq Q_1$  and  $Q_1$  c-commands  $Q_2$ , then  $Q_2$  cannot select  $i$ .

We can see how (13) and (14) work by referring to the LFs in (12.a,b). In (12.a), Operator Indexing copies the index  $i$  onto the quantifier FEW, but not onto the existential quantifier introduced by existential closure, although the  $i$ -indexed trace is in its scope, because that would violate (14). But in (12.b), the existential is the lowest c-commanding quantifier over the indefinite, whose index is therefore selected by it and not by FEW.

§4 Now let's return to the quantificational contrasts between *wh*-phrases and indefinites. The first thing to notice is that a *wh*-phrase undergoes *wh*-movement, which puts it in [Spec,C'], that is, outside the domain of the subordinate IP. Since an adverb of quantification is adjoined to IP, an immediate consequence of *wh*-movement is the impossibility of a *wh*-phrase getting directly bound from within its own clause; this accounts for the fact that the *wh*-phrase in (7.a) does not have the force of the embedded adverb of quantification. The only way, then, that an adverbial quantifier can bind a *wh*-phrase is by being in a clause superordinate to it; in this case, I have argued, the *wh*-clause is accommodated into the restrictive term of the quantifier. For the sentences in (6.a) and (7.a), this results in the respective translations in (15).

- (15)a. FEW( $x$ ) [regular-customer'( $x$ ) & tip-big'( $x$ )] E  
 [remember'(m, [regular-customer'( $x$ ) & tip-big'( $x$ )])]



- b. ALL(*x*) [FEW(*t*) [TIME(*t*)] [regular-customer'(*x*) & tip-big'(*x*,*t*)]] E [remember'(m,[FEW(*t*) [TIME(*t*)] [regular-customer'(*x*) & tip-big'(*x*,*t*)]))]

Note that in (15.b) the quantifier ALL is an implicit default universal.

In contrast to *wh*-phrases, an indefinite does not undergo *wh*-movement; this means it can be bound within its clause. Here there are two possibilities: it either ends up in the restrictive term of an adverb of quantification, or else in its nuclear scope, where it gets bound by existential closure. The first possibility is exemplified by (6.b), where the quantificational force is supplied by an implicit default universal or generic quantifier; (7.b); (8.b); and the reading of (10) according to (11.a). The second possibility is exemplified by the reading of (10) according to (11.b), and also by the sentences in (16).

- (16)a. The maître d' at Maxim's remembers that regular customers tipped big yesterday.  
b. Regular customers tipped big yesterday.

These sentences are episodic, which favors the existential reading, in contrast to the habitual sentences we have looked at, which generally favor the quantificationally variable reading of indefinites.

Note that *wh*-phrases do not get the reading that results from existential closure, as the sentences in (17) illustrate (I've changed the adverb of quantification in (17.a) to one compatible with an episodic reading).

- (17)a. The maître d' at Maxim's hardly remembers which regular customers tipped big yesterday.  
b. Which regular customers tipped big yesterday?

In (17.a), notwithstanding the episodicity of the sentence, the *wh*-phrase is quantified by the matrix adverb, and has about the same interpretation as (6.a) (aside from the habitual/episodic distinction). And the *wh*-phrase in (17.b) has the same set-of-values reading as (8.b). The fact that existential closure doesn't apply to *wh*-phrases is of course a consequence of *wh*-movement. In short, the fact that *wh*-phrases undergo movement to [Spec,C'] accounts for their inability to be quantified by both an adverb of quantification within their own clause and by existential closure.

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§5 Now the question arises, since presupposition accommodation is the means by which *wh*-phrases get to be quantified by the matrix adverb, why doesn't the same thing happen with indefinites in a *that*-clause? I would like to suggest that this is because presupposition accommodation of *that*-clauses has a different semantic effect from that of *wh*-clauses, and that this difference is reflected in the logical form. To motivate this, let's add to the paradigm in (6) and (7) the sentences in (18), in which an indefinite is in an *if*-complement:

- (18)a. The maître d' at Maxim's seldom remembers if regular customers tip big.  
 b. The maître d' at Maxim's remembers if regular customers seldom tip big.

Both of these sentences are ambiguous between a purely frequency reading of the adverb, and one in which it quantifies the indefinite. That is, the indefinite in (18.a) can be quantified by the matrix adverb, while the indefinite in (18.b) can be quantified by the embedded adverb. If the adverbs have the frequency interpretation, the indefinites have generic force.

Quantification by the matrix adverb indicates that the indefinite becomes part of the adverb's restrictive term. Indeed, it has been convincingly argued by Lewis, Kratzer, and Heim, that a semantic function of *if*-clauses is just to restrict the domain of quantification. I suggest that *wh*-clauses also have such a semantic function. Because of this, the result of presupposition accommodation of such clauses will be to put them in the restrictive term. That presupposition accommodation is at play in sentences with *if*-complements is further indicated by the existence of the quantifiability effect brought up in connection with the sentences in (5). This effect is not confined to *wh*-phrases, as the sentence in (19) illustrates:

- (19) The maître d' at Maxim's seldom wonders if a regular customer tips big.

Here the adverb only has a temporal reading, while the indefinite, just like the *wh*-phrases in (5), does not receive the quantificational force of the adverb, and for the same reason: the complement is not presupposed by the matrix predicate, so it does not become part of the restrictive term of the quantifier. However, unlike the *wh*-phrases in (5), the indefinite in (19) has generic force, which can be attributed to an implicit generic

quantifier adjoined to the embedded IP. This is supported by sentences such as those in (20):

- (20)a. John asked the professor if students usually pass her course.  
 b. Bosses often don't care if employees seldom earn enough.

The indefinites here have the quantificational force of the embedded adverb of quantification, on the non-frequency reading, just as in the non-frequency reading of (18.b).

Returning to *that*-clauses, what distinguishes them from *wh*- and *if*-clauses is that they do not have the restrictive function that these two clause types have. Instead, I suggest that, when a *that*-clause is presupposed, it is accommodated independently of the restrictive term. This means, in syntactic terms, that in logical form the accommodated *that*-clause is outside the scope of the matrix quantifier. In other words, I propose that presupposition accommodation of *that*-clauses is syntactically as high up in the sentence as possible. On this account, the sentences in (6.c) and (7.c) receive the translations in (21) (where G represents the generic operator).

- (21)a. [G(x) [regular-customer'(x)] E [tip-big'(x)]] & [FEW(t) [TIME(t)] E [remember'(m, [G(x) [regular-customer'(x)] E [tip-big'(x)]], t)]  
 b. [FEW(x) [regular-customer'(x)] E [tip-big'(x)]] & [remember'(m, [FEW(x) [regular-customer'(x)] E [tip-big'(x)]])]

Independent evidence for this effect of presupposition accommodation of *that*-clauses comes from the following observation by Angelika Kratzer (p.c.). She notes that the sentence in (22.a) does not have the interpretation in (22.b), in which the *that*-clause appears in the restrictive term, but rather that in (22.c), in which it has been accommodated beyond the restrictive term<sup>2</sup>:

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<sup>2</sup>In work in progress, I attempt to show that the difference between *wh*- and *if*-clauses, on the one hand, and *that*-clauses, on the other, with respect to presupposition accommodation, corresponds respectively to the distinction between local and global accommodation in the theory of Heim (1983).

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- (22)a. If Galileo claims that the earth is round, he knows that the earth is round.  
 b. If Galileo claims that the earth is round and the earth is round, he knows that the earth is round.  
 c. The earth is round and if Galileo claims that the earth is round, he knows that the earth is round.

§6 I have shown how a *wh*-phrase gets bound from outside its clause, namely, as a result both of *wh*-movement, which puts it beyond the scope of a quantifier adjoined to its IP, and of presupposition accommodation of the *wh*-clause, which puts it in the restrictive term of the matrix quantifier. It remains to deal with direct questions, as in (8.a), and sentences in which the *wh*-clause is embedded under a nonfactive predicate, as in (5). In the former, there is no higher clause from which the *wh*-phrase can be bound, and in the latter, there is no presupposition accommodation, which I will show also yields the same result. In such cases, I argue, the *wh*-phrase is not quantified at all, but is evaluated as a set of appropriate values, along the lines of Hamblin's analysis of questions. Hamblin proposes to treat *wh*-phrases as denoting sets of individuals and, correspondingly, *wh*-clauses as denoting "sets of propositions, namely, those propositions that count as answers to" them (1976, 254). He calls such sets *denotation-sets*.

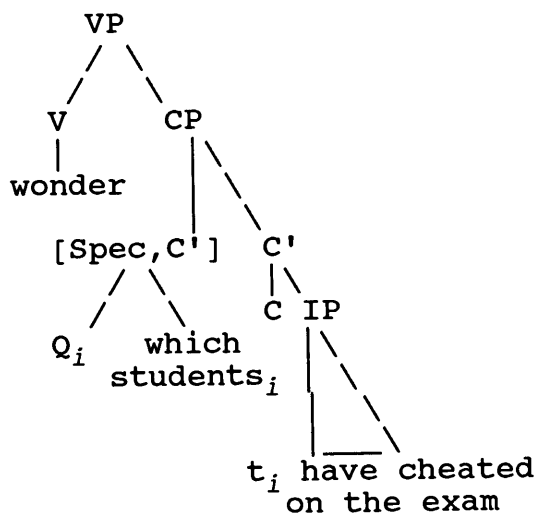
Hamblin intends that every *wh*-clause should be analyzed as a denotation-set; on the other hand, I want to restrict this usage to those cases where a *wh*-phrase does not display quantificational variability, namely, in direct questions and under nonfactive predicates. I will do this by adapting a proposal going back to the analysis of questions by Katz and Postal. They introduce an abstract morpheme *Q*, which they say "indicates semantically... that the sentence is a question" (1964, 89). Structures containing the *Q*-morpheme are mostly matrix clauses, but in addition Katz and Postal assume that the complements of *wonder* and a few other verbs contain *Q*. With all other *wh*-embedding verbs, the complement clause is not headed by *Q*. This use of a *Q*-morpheme is quite different from the familiar usage due to C. L. Baker. Baker treats *Q* basically as a scope-marker for *wh*-phrases; on this view, every *wh*-clause, direct and indirect, contains *Q*. While it is obviously necessary to distinguish the different scope possibilities of *wh*-phrases, I agree with Katz and Postal that it is also necessary to distinguish different types of *wh*-clauses, which the Baker view of *Q* does not do. (This point has been emphasized by Munsat (1986), though he does not formulate a

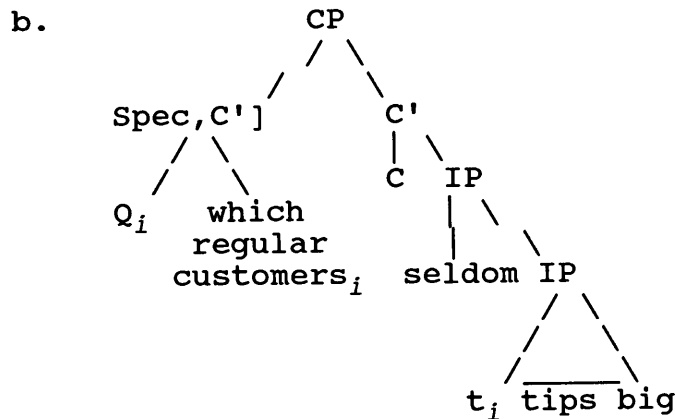
precise semantic analysis of *wh*-clauses.)

What I propose is that *Q* heads all matrix *wh*-clauses and also those *wh*-clauses that are complements of a nonfactive predicate. This idea may be implemented along the following lines. Suppose that *Q* is a base-generated operator in [Spec,C'] of matrix *wh*-clauses. Similarly, suppose that nonfactive predicates that subcategorize for *wh*-clauses also semantically select *Q* (which is base-generated in the embedded [Spec,C']); this follows the familiar account of Grimshaw's, but only part way, because she, like Baker, has all *wh*-embedding predicates *s*-selecting *Q*.

According to the analysis I have developed, matrix *wh*-clauses and *wh*-clauses embedded under a nonfactive predicate have exactly the same sort of logical form and, hence, the same sort of interpretation. In neither case can the *wh*-phrase get bound from outside of its clause; this is obvious with a matrix clause, but it is also true of a clause embedded under a nonfactive predicate, as a consequence of the rule of Operator Indexing in (13) in conjunction with the wellformedness condition in (14): *Q*, although not a quantifier, is a variable-binding operator, selecting any free variables in its scope. And we have already seen that a *wh*-phrase can never get bound by a quantifier within its clause. The result is that a *wh*-phrase in such a clause cannot get bound by a quantifier at all, thus a fortiori fails to display quantificational variability. In (23) are illustrated two *Q*-bound LFs, for (5.a) and (8.a).

(23) a.



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The result of evaluating a Q-bound structure will be a set of propositions, as in Hamblin's interpretation of questions; the members of such a set are determined by assigning an appropriate value to each of the variables bound by Q, which translate the *wh*-phrases within the clause. This interpretation algorithm is formalized in the denotation in (24) (where each  $x_i$  represents a variable translating a *wh*-phrase):

$$(24) \quad \llbracket Qx_1 \dots x_n S \rrbracket^g = \{p : \exists a_1 \dots a_n [p = \llbracket S \rrbracket^{g'}], \text{ where } g' \text{ is just like } g \text{ with the possible difference that } g'(x_i) = a_i, 1 \leq i \leq n.\}$$

There are some similarities between this Q-operator analysis and the analysis in Taisuke Nishigauchi's dissertation, but they are essentially different.<sup>3</sup> There it is also assumed that *wh*-phrases are translated with free variables and can be bound by quantifiers of various quantificational forces. In Japanese these include a set of interrogative particles or morphologically realized question operators, which apparently have either existential or universal force (thus, if this characterization is correct, they are not semantically the same as the abstract Q operator I am assuming for English). Nishigauchi assumes these operators occupy C at LF, where they govern the *wh*-phrase in [Spec, C'], and, he proposes, bind it. A crucial difference between my analysis and Nishigauchi's, however, is that in the latter the question

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<sup>3</sup>Asher (1987) also uses a Q-operator in his DRT analysis of indirect questions. It is not a variable-binder but is used to block anaphoric relations between the matrix clause and the indirect question. This opacity inducing function is conceptually similar to my Q-operator, which in effect makes the embedded clause opaque to quantification of the Q-bound variables from outside.

operator is allowed to quantify both a *wh*-phrase and the nominal head of the phrase containing it. This is illustrated by the sentence in (25):

- (25) John-wa [[dare<sub>i</sub>-ga kai-ta] hon<sub>j</sub>-o] yomi-tai-no<sub>i,j</sub>;  
       TOP who-NOM write-PST book-ACC read-want-Q  
       'John wants to read (a) book(s) that who wrote?'

According to Nishigauchi's analysis, this should have an interpretation such that pairs of books and authors are being asked about, but as Kawasaki (1989) has observed, this would make the sentence identical in meaning to one where *hon* 'book' is replaced by *dono hon* 'which book'; however, whereas (25) can be answered by *Austin-desu* '(it's) Austin', a sentence with two interrogative phrases could not be. Kawasaki suggests this indicates that question operators can only bind *wh*-phrases. This is consistent with my analysis.

§7 To summarize and conclude, I have shown that *wh*-movement partly determines the domain in which *wh*-phrases can be quantified; I have also shown that differences in the quantifiability of indefinites depend on the kind of clause they are in, which leads to distinct logical forms, arising from the effect of presupposition accommodation; finally, I have argued for the presence of an abstract nonquantifying *wh*-phrase binder where *wh*-phrases fail to display variable quantificational force.

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