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Functional WH and Weak Crossover

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1. WH - quantifier interactions.

Much recent discussion has been devoted to the interactions between quantified NPs and wh-phrases, such as those exemplified in (1) and (2).

(1) a. who$_i$/which professor$_i$ does everyone like t$_i$?

    b. Individual answer: Professor Smith

    c. Pair-list answer: Bill likes professor Smith, Sue likes professor Jones,....

(2) a. who$_i$/which professor$_i$ t$_i$ likes everyone?

    b. Mary

    c. * Professor Smith likes Mary, professor Jones likes Paul,....

The question in (1) admits both the individual answer, exemplified by (1b), and the pair-list answer, exemplified by (1c), where what is specified is for each individual who that individual likes. The question in (2) seems not to admit the pair list answer. All the accounts of this phenomenon that I am familiar with view it as a constraint on scope. The question in (1) is said to have a reading where everyone has semantic scope over the wh-phrase. On this reading, (1) is interpreted roughly as in (3a).

(3) a. For each person x: who does x like?

    b. * For each person x: who likes x?

Per contrast, the question in (2) seems to disallow a wide scope construal of everyone such as the one in (3b). Most of the work on this topic is an attempt to explain why (3b) is out. I believe, however, that the main premise of these attempts, namely that we are dealing with a scope problem, is misguided. I will try to make a case that the contrast between (1) and (2) is not due to the relative scoping of the WH-phrase vs. the quantified NP but is essentially a crossover phenomenon. What causes the ungrammaticality is the fact that in (2) but not in (1), scoping the quantifier out involves crossing over the trace of wh.[1]

Before presenting my case, it may be worth briefly recalling some of the main attempts to account for the contrast in (1)-(2). An influential attempt is due to May (1985,1988). May's main assumptions are summarized in (4). The first assumption is

the scope principle, given in simplified form in (4a).

(4) a. The scope principle: elements of a σ-sequence can be interpreted freely with respect to scope relative to each other.
Examples:
i.

[a woman$_j$ every man$_i$ [t$_i$ loves t$_j$]] $\diagdown$ $\begin{array}{c}\nearrow \forall \exists \\ \searrow \exists \forall\end{array}$

ii.

[who$_i$ everyone$_j$ [t$_j$ loves t$_i$]] $\begin{array}{c}\diagup \text{WH } \forall \\ \diagdown \forall \text{ WH}\end{array}$
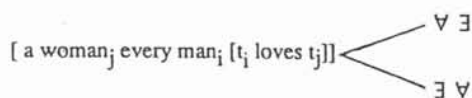
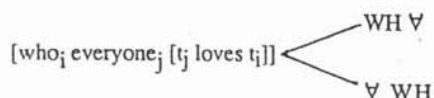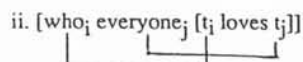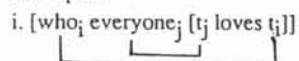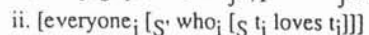b. The path containment condition (Pesetsky 1982): if two paths overlap, one must contain the other.
Examples:
i. [who$_i$ everyone$_j$ [t$_j$ loves t$_i$]]

ii. [who$_i$ everyone$_j$ [t$_j$ loves t$_j$]]

c. NP's can adjoin to S (IP), VP, NP but not to S' (CP)
Examples:
i. [who$_i$ [$_S$ t$_i$ [everyone$_j$[$_{VP}$ loves t$_j$]]]]   WH $\forall$
ii. [everyone$_j$ [$_{S'}$ who$_i$ [$_S$ t$_i$ loves t$_j$]]]

So, for example, in every man loves a woman, the two NP's are QRed and adjoined to S (or IP) at LF, say as shown in (i) under (4a). They form a σ-sequence as they govern each other and the scope principle stipulates that they can be interpreted in either order. That is either as $\exists\forall$, which matches their adjunction order, or as $\forall\exists$, which is the opposite of their adjunction order. The same holds a wh -quantifier sequence. Who and everyone in ii under (4a) form a σ-sequence and thus either scope is possible. A significant consequence of the scope principle is that LF no longer disambiguates scope.

The second main aspect of May's account is the path containment condition (cf. Pesetsky (1982)), given in simplified form in (4b). This condition is met in (i) under (4b) which is the LF associated with (1), but not in (ii) under (4b), which is the LF associated with (2). To actually cash in on this account some further assumptions concerning possible adjunction sites are needed. They are spelled out in (4c). The possibility of adjoining NP to VP will allow for sentences like (2) to have a logical

form like (i) under (4c).Here wh and quantifier are too far apart to form a σ-sequence. Hence the scope principle doesn't apply and the only interpretive option will be the one where WH has scope over the quantifier. The ban against S'-adjunction for NP's becomes crucial, as to disallow (ii) under (4c) as a possible representation for (2).This representation would satisfy the path containment condition and allow for a wide scope construal of every. So (4a-c) jointly determine that the semantically ambiguous (ii) under (4b) is the LF of (1) while the semantically unambiguous (i) under (4c) is the LF of (2). From this it follows that (1) admits two types of answers, while (2) only admits the individual answer.

Without trying to address the empirical problems that have been alleged to arise in connection with this approach, it cannot fail to be noted that it is based on a set of assumptions that are fairly construction specific. In particular, the facts in (1)-(2) constitute the main if not the only empirical backing of the scope principle. If we could account for those facts in terms of principles that are more clearly independently needed, we would evidently be better off.

I believe that the same general point can be raised in connection with other attempts to deal with quantifier-wh interaction. Williams (1988), for example, proposes an account based on Q-superiority:

(5) Q-superiority (Williams 1988)

If the scope of Q includes the scope of wh, Q must C-command the trace of wh. More recently Lasnik and Saito (1991) have proposed an account based on a version of rigidity, summarized in (6), that appears to be related to Williams's Q-superiority:

(6) Rigidity (Lasnik and Saito (1991))

a. Suppose Q_1 and Q_2 are operators (quantified NP of WH). Then Q_1 cannot take wide scope over Q_2 if t_2 c-commands t_1.

b. QR adjoins a quantified NP to a minimal node to satisfy (a).

Both these accounts, besides raising the issue of the amount of independent evidence supporting them, have the consequence of fixing the scope of quantifiers on the basis of their S-structure (or D-structure) position. So in particular they predict that a wide scope construal of the VP-internal NP in the examples in (7) is either marked or impossible:

(7) a. An advisor will be assigned to every freshman

   b. A soldier was standing in front of every entrance

   c. An expert has inspected every plane

This prediction seems plainly wrong to me, at least as far as languages like English are concerned.

2. Functional readings.

I think that a deeper understanding of the asymmetries in (1)-(2) can be gotten by focusing on the so called functional readings of questions, exemplified in (8):

(8)   a. who/which person does every Italian male love?

b. his mother

c. Giovanni, Maria

Paolo, Francesca   .....

Here the short answer in (8b) is not understood as picking out an individual. Consequently it could not be viewed as a special case of the individual answer. Could it be possible, then, to view (8b) as an instance of the pair-list answer? One might argue that the answer in (8b) is after all just a short way of providing a list such as the one in (8c) where the first member of the list is an italian and the second his mother. This is, however, untenable for two main reasons. First, an answer like (8c) just doesn't provide the same information as (8b). Second, there are questions that do not admit pair-list answers but do admit functional answers. A case in point is (9):

(9)   a. who does no Italian married man like?

b. his mother in law

c. *Giovanni, Maria

Paolo, Francesca   ....

(9b) constitutes a possible answer to (9a), but a list like (9c) does not. This suggests that answers such as (8b) or (9b) constitute a phenomenon distinct from (though perhaps related to) the pair list reading. Intuitively, the phrase his mother in (8b) or in (9b) is a way of individuating a map, a function from Italians into their mother (or mother in law). This interpretation of questions has been studied extensively by Engdahl (1986) and Groenendijk and Stokhof (1984). On the basis of considerations such as those I have sketched, these works argue quite convincigly that questions have a distinct functional reading, which in the case of (8) can be informally paraphrased as follows:

(10)   a. which function f is such that every Italian x loves f(x) ?

b. which function f makes the following true: for every italian x: x loves f(x)

Let us consider more explicitly what the syntax and semantics of functional readings involves. I will adopt here Karttunen's (1977) semantics of questions, even though most of what I will say is reconstructable on other theories. As is well-known, Karttunen analyzes the meaning of a question in terms of the propositions which, taken jointly, constitute the complete set of its true answers. For example a simple constituent question like (11a) is interpreted as in (11b).

(11)   a. who does John love?

b. $\{p: p$ is true and for some $x, p = $ John loves $x\}$

c. {John love Mary, John loves Mark}

The wh-phrase is associated with an existential quantifier. In a world where John loves Mary and Mark, the set in (11b) will be the set containing the propositions "John loves Mary" and "John loves Mark", namely (11c). On this approach, which can be

varied on in a number of ways, the functional reading of (8a) will be interpreted as follows:

(12)   a. $\{p : p$ is true and for some f, $p = $ every italian$_x$ loves $f(x)\}$

b. (every italian$_i$ loves his$_i$ mother)

In a world where the only function that constitutes a true short answer to (8a) is the one mapping each Italian into his mother, the set in (12a) would contain just the proposition "every italian loves his mother", as exemplified in (12b).

An interesting question is how do we map compositionally (8a) into (12a)? Evidently we must assume that wh-words are associated (or can be associated) with two things: a function and an argument.[2] As the function and the argument constitute two semantically distinct elements, it seems plausible to maintain that they are syntactically projected as two distinct nodes, say as in (13):

(13)
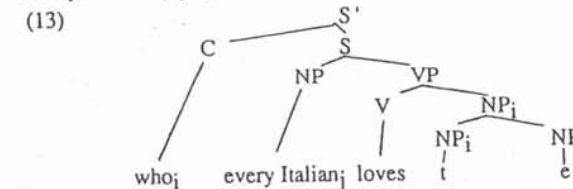
In (13) the wh-word leaves behind a complex trace, which has the form of an adjunction structure[3] (akin to inverse linking structures -- cf. e.g. May (1985)). I will abbreviate the structure in (13) as shown in (14).

(14)   [who$_i$ [every Italian$_j$ loves [e$_i^j$]]]

I assume that the subscript corresponds to the function and is bound by the wh-phrase in Comp. The superscript corresponds to the argument. Its value is determined by coindexing it with a C-commanding NP, in the case at hand the subject NP. The structure in (13) maps in a direct and obvious way onto the meaning in (12). I will call the index corresponding to the function the f-index and the one corresponding to the argument the a-indeces. It should note that while the f-index clearly functions as a wh-trace, the a-index has the features of a bound pronominal, on at least two counts. First, unlike a wh-trace, an a-index doesn't form a chain with its antecedent, as it doesn't share a θ-role with it. Rather the a-index receives an independent, adjunct θ-role. The analogy here is with the pronoun his in possessive constructions like his mother, which constitute a prototypical answer to functional questions. Moreover,

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[2] I will adopt throughout a GB terminology, though it should be clear that my main point is independent of this particular choice of framework.

[3] An alternative might be to regard one of the two components of a functional wh-compex as a complement (rather than an adjunct) of the other. The problem with this view is that there can be an indefinite number of arguments in a functional wh-complex. See sec. 5 for relevant examples and further discussion.

unlike traces, the a-index is bound by a quantified NP. In the example (13), it is bound by the subject NP. These can be taken as diagnostics that a-indeces are pronominal elements of a kind (in a loose non technical sense of "pronominal").

I am not sure at present of the exact nature of the empty category associated with the a-index. One possibility is to assume that such category is a variable associated with an operator as indicated in (15):

(15)

$$
\begin{array}{c}
\text{NP} \\
\underline{\qquad\qquad} \\
O_j \qquad \text{NP}_i \\
\qquad \underline{\qquad\qquad} \\
\text{NP}^i_i \qquad \text{NP}_j \\
\quad | \qquad\qquad | \\
\quad t \qquad\qquad e
\end{array}
$$
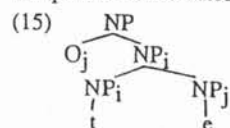
There are several conceivable alternatives to (15). But while the exact details of how functional wh-complexes are implemented might turn out to have interesting consequences, I don't think that they will affect my main point. What is important for what I want to say is that functional wh-complexes must be made up of two parts, one corresponding to the function and the other to the argument. In order to interpret functional questions, we must assume minimally the existence of more structured wh-traces, involving two indeces. Of these, the f-index behaves like an ordinary wh-trace, while the a-index behaves like a bound pronominal.

The existence of functional wh-dependencies has, I believe, a profound relevance to wh-quantifier interactions. To this issue I now turn.

3. The dispensability of quantification into questions.

So far we have been talking as if a question like (16a) had three independent semantic representations. The first one, given in (16b), is responsible for the individual answer. The second one, in (16c), is responsible for the functional reading. And the third one, schematically represented in (16d), yields the pair list answer:

(16) a. who does every Italian like?

b. [who$_i$ every Italian$_j$ [e$_i$ likes t$_j$]]

==> {p: p is true and for some x, p = every Italian likes x}

c. [who$_i$ every Italian$_j$ [t$_i$ likes [e$_i^j$]]]

==> {p: p is true and for some f, p = every Italian$_y$ likes f(y) }

d. For every Italian y : who does y like?

Now I want to point out a number of problems with (16d). I believe that these problems taken together cast serious doubts on the legitimacy of quantifying into questions.

The first point is quite straightforward. Quantification as a semantic operation is defined on propositions, not on questions. For example, on Karttunen's approach questions are sets of propositions and one cannot directly attach a quantifier to a set.

The structure in (17) is ill-formed.

(17) * Qx {......}

This is not to say that something that has the effects of (16d) cannot be defined as an operation on sets of propositions. But it will require a generalization of quantification beyond its standard boundaries. This situation doesn't arise just in Karttunen's theory. Any theory of questions assigns to them a semantic category different from that of ordinary propositions. Groenendijk and Stokhof (1984) interpret questions as propositional concepts; Higginbotham and May (1981) as sets of theories. Consequently on any such approach, if one wants to quantify into questions, some non trivial extension of standard quantifying in mechanisms will be needed.

It may be objected that such extensions are needed anyhow. Various people (from Montague to May) have argued that one has to quantify into categories other than sentences, such as VP and NP. In the framework we are adopting, this takes the form of letting QR adjoin quantifiers to VP and NP. And very general cross-categorial semantics for these types of non clausal quantification have been worked out (for example in Partee and Rooth (1983)). So why not quantify into questions? The problem is that no semantics for crosscategorial quantification will work in general for question. This can be seen simply and informally by considering what we would get if we try to quantify into a question a quantifier like no one:

(18) a. Who does no one like?

b. For no x: who does x like?

c. ¬ ∃x[I want to know for which y, y loves x]

But (18b-c) just don't make sense as representations of (18a). There seems to be no way to quantify quantifiers like no one into questions. And this is as it should be, for if quantifying in corresponds to pair list readings, and if no one could be quantified in, one would expect (18a) to admit a pair list answer, contrary to fact.

It turns out that were we to extend quantification to questions, the NP's that could more or less naturally undergo such an operation form a very restricted class. In (19) I provide a partial list.

(19) From Groenendijk and Stokhof (1984):

NP's quantifiable into questions and supporting pair-lists	NP's not quantifiable into questions and not supporting pair-lists
every man	no man
all men	at most n men
the man/the men	few men/many men
the two men	(at least) two men
both men	neither man
John and Peter	a man
	some man/some men

Even a superficial look at the table in (19) reveals that the quantifiable NPs are all,

essentially, universals. That is all the quantifiers in the left colum of (19) have a common core meaning that can be represented as in (20)

(20) $\{X: MAN \subseteq X\}$[4]   (X ranges over sets)

I am assuming, as is standard in the theory of generalized quantifiers, that quantified NP's are interpreted as sets of sets. Universal quantifiers are generated by taking all the supersets of a given set. The set whose supersets we are considering (in (20), the set of men) is called the generator of the quantifier. Such a set can be retrieved from universal quantifiers by taking their intersection as illustrated in (21a):

(21)   a. $\cap \{X: MAN \subseteq X\} = MAN$

   b. D is universal $=_{df} \forall X [D(A)(X) \leftrightarrow A \subseteq X]$

In (21b) I give the general definition of what universality amounts to. The quantifiers that could at all be quantified into questions (and support pair-list readings) are all and only those that have a generator, viz. the universal ones.

What emerges from these considerations is that even if we try to extend quantification to questions, this extension better apply to just those NP's that have a universal meaning. This is surprising. Other generalizations of quantification to non clausal categories like VP are total: they apply uniformly to every kind of NP. But quantifying into questions, if defined, could at best be a partial operation. This can be taken as further evidence of the fact that questions are recalcitrant to quantification.

There is a final point that, in light of the previous considerations, seems to undermine even more the very idea of quantifying into questions. The point is the following: given what we need to handle functional readings, quantifying into questions becomes superfluous. It doesn't add anything that we can't already express by quantifying over functions. To see this, consider the structure of a functional question, given again in (22).

(22)   For which f, everyone$_x$ loves f(x)

Here we are asking for the values of f that make "everyone$_x$ loves f(x)" true. Now think of what a list actually is. A list is a set of ordered pairs. But that is just was the extension of a function is. So any pairing of a lover with a lovee, i.e. any pair list will form a function that can satisfy (22) and thereby constitute a possible answer to it. The pair list reading of a question is thus already part of (22). Not to get it as a possible answer to (22) we would need a special stipulation. Lists arise as a special case of functional readings.

Our considerations are summarized in (23):

(23)   i. Quantifying in is not defined on questions to begin with.

   ii. If we extend quantifying in to questions we must make it partial

      (i.e. restricted to universal NP's).

   iii. Lists are functions of a kind. Consequently, list answers are

[4]In quantifiers of the form the n men it is further required that the set of men have cardinality n.

functional answers of a kind. We don't need Q-in to get pair list readings. On this basis it seems hard to avoid the conclusion that quantifying into questions creates by far more problems than it solves. A reasonable consequence to draw is that quantifying in and questions just don't mesh. Questions are not of the right type to allow for quantifying in and we should just leave it at that. This is fact the conclusion that on the basis of related considerations Engdahl (1986) reaches.[5]

There is an issue, however, that immediately comes to mind in this connection. If lists are a special case of functional readings, how come that only universal NP's license them? Consider for example the question in (24a):

(24)   a. who does no one like?

   b. no one$_x$ likes f(x)

(24a) admits a genuinely functional answer (like "his mother in law") but not a pair list answer. The abstract structure of the functional reading of (24a) would be as in (24b). The question is, of course, why list functions are ruled out as possible values of f in structures like (24b).

I do not have a complete answer to this question. I think though that there are enough indications of the direction in which a satisfactory answer may be found, building on a suggestion made in this connection by Groenendijk and Stokhof (1984). The point, in a nutshell, is the following. To draw a list, we need a domain to draw members from. What determines such a domain in the case at hand? Quite clearly the quantifier that binds the a-index. From which quantifier meanings can we immediately retrieve at domain? From those that have a generator set, viz. the universal ones.

Let me try to elaborate on this point a bit. Think of a what a "natural" function, like, say, addition, is. Intuitively, it is a method of getting at certain outputs from given inputs. We don't know exactly what grasping such a connection amounts to. When does one exactly know addition? What does such knowledge consist of? These are problems that we still don't have a full answer to. We do know, though, that grasping a function certainly does not involve scanning the totality of its input-output pairs, what is sometimes called the graph of a function. For example, our uderstanding of the functions in (25) has hardly anything to do with going over the list of their input-output pairs:

(25)   a. $\lambda n [n + 1]$ (successor)

   b. $\lambda x [\text{mother of}(x)]$

The function in (25a) maps each number into its successor. The function in (25b) maps an individual into his or her mother. Understanding a "natural" function" like these means understanding its intension, not its extension.

[5] Groenendijk and Stokhof (1984) reach a different conclusion. They argue that quantification over functions must be restricted to the "natural" ones and that quantification into questions is still needed in order to get the pair list reading.

Lists viewed as functions are just the opposite. They cannot be characterized but in terms of the set of their inputs and outputs. They can only be grasped by scanning their graph. They are, as it where, pure extension.

I have been speaking as if lists viewed as functions are somehow "unnatural". This may be misleading. After all, functions are ways of relating inputs and outputs and lists certainly and legitimately do fall under such category. Perhaps a better way of thinking about this distinction is by thinking of lists as functions that either don't have an intension or have a trivial one, one that as it were coincides with their extension. Per contrast, what we have been referring to as "natural" functions (like the successor-function or the mother of-function) have a genuine, non trivial intension. To understand something is to grasp its intension. So in particular, to understand a function is to grasp its intension. But certain functions, namely lists, happen to have a trivial intension, one that amounts to their graph.[6]

Keeping this distinction between list and non list functions in mind, let us go back to functional readings of question. Our objective is to understand why lists are addmitted in (22) but not in (24b). The common structure of these questions can be represented as in (26).

(26) $Qx [x \text{ loves } f(x)]$

"f" in (26) is a variable ranging over functions. Now suppose that f is a non list function, i.e. a function which is graspable intensionally, independently of its extension. Do we know, then, what proposition (26) expresses? Yes, because we can compute, as it were, what the intension of f contributes to to the intension of (26) as a whole. Suppose, per contrast that f is a list. Do we know what proposition (26) expresses? No. A list lacks an intension that we can use to get at the global intension of (26), i.e. the proposition it expresses. If f is a list, in order to determine what proposition (26) is, we have to run through the values of f one by one. This is only possible if we can indentify the domain of f. What determines such a domain? Evidently Q, the binder of the argument of f. But only certain quantifiers determine a domain, namely those that have a generator set: the universal ones. Differently put, (27a) is equivalent to (27b):

(27)   a. $\text{everyone}_x [x \text{ loves } f(x)]$

b. $a_1 \text{ loves } f(a_1) \text{ and } ..... \text{ and } a_n \text{ loves } f(a_n)$, where $a_1,..., a_n$ are all the people

But this equivalence holds only of universal quantifiers. It wouldn't hold, for example, of no one or someone.

What emerges from these considerations is this. The only reading of questions

[6] In possible world semantics, mathematical functions (like the successor function) turn out to have the same extension at every world. Still in an obvious sense their intension is far from being trivial. This is just an instance of the well-known limitations of a possible world based reconstruction of intensionality.

(besides the individual one) is the functional reading.[7] The functional reading subsumes as a special case the so called pair list reading, given that lists are just functions of a certain kind. Why only universal NP's support lists follows from general semantic and pragmatic considerations (namely to draw a list one needs a domain, which is naturally supplied only by universals).[8]

4. WH-quantifier interactions as crossover phenomena.

In light of these considerations, it becomes clear why the wh-quantifier interactions exemplified in (1)-(2) cannot be a matter of relative scoping of quantifiers with respect to wh-phrases. If, as Engdahl and myself have argued, there is no sensible way to quantify into questions, there is, a fortiori, no way to assign to the quantifier semantic scope over wh-phrases.

What then of the impossibility of a list reading for (2)? Consider how such a reading could come about. List readings are a case of functional reading, so the wh-trace would have to be a functional one. Accordingly, the S-structure of a question like (2) would have to be as shown in (28):

(28) $\text{who}_i [e_i^j]$ likes everyone_j

But then the object NP cannot be a proper antecedent for the a-index, as it does not C-command it. In order for the object NP to bind j, it would have to cross over it. The parallel with standard crossover configurations, such as (29) is there for everybody to see.

(29) a. his_j mother loves everyone_j

b. who_j does his_j mother loves t_j

Whatever accounts for the ungrammaticality of (29) cannot fail to extend to (28). Consider, for example, (28) in light of Koopman and Sportiche's bijection principle. The corresponding LF is given in (30)

[7] In fact, the individual reading can be viewed as a special case of the functional one, by identifying individuals with o-place functions. See Engdahl (1986) for details.

[8] Note that while for English I am assuming that list and functional readings of questions have the same LF, this is not a necessary consequence of the considerations in the text. What does follow from those considerations is that if the list reading should turn out to have a LF distinct from the functional one, such a LF could not be interpreted in terms of quantifying in. Its interpretation would have to be parallel the one of functional readings but where the existential quantifier associated with wh is restricted to list functions. See K. Yoshida (1990) for relevant discussion of Japanese data that might call for such a modification of the present analysis.

(30)

who$_i$ everyone$_j$ t   e   like   t

where the quantifier has undergone QR. Here $[_{NP_j} e]$ and the trace of <u>everyone</u> end up being both A'-bound by the raised quantifier, in violation of bijectivity. Parallel considerations, mutatis mutandis, would rule (30) out on the basis of other approaches to weak crossover, such as Safir's parallelism constraint, or Reinhart's C-command based approach, or, for that matter, May's (1985) approach in terms of path containment. Personally, I believe that weak crossover is still a poorly understood phenomenon. But that is in a way beside the point. What is clear, is that if I am right on the nature of functional readings, then the wh-quantifier interaction will fall together with crossover violations.

If the structure in (30) is ruled out by whatever accounts for weak crossover violations, the only available option for the question under consideration will be the individual answer represented in (31).

(31)   who$_i$ everyone$_j$ $[[t_i]$ likes $t_j]$ ✗   everyone

==> {p: p is true and for some x, p = everyone loves x}

No crossover violation arises in this case

Consider per contrast the LF associated with (1) -- repeated here as (32a) -- that admits a pair list reading. Such a LF is given in (32b).

(32)   a. who does everyone like?

b. who$_i$ everyone$_j$ $[[t_j]$ loves $[t_i^j]]$

Here <u>everyone</u> binds the trace in subject position, which in turns bind the a-index of the wh-phrase in object position. The a-index, therefore does not qualify as a (syntactic) variable and no violation of bijectivity ensues.

This approach extends naturally to other cases that have been noted in the literature. Let us go over some of them. To begin, a contrast parallel to the one between (1) and (2) has been observed in structures like those in (33).

(33)   a. Tell me in which place John put every book

He put "Formal Philosophy" on his desk, LGB on his night stand...

b. Tell me which book John put in every drawer of his desk

* He put "Formal Philosophy" in his right drawer, LGB in his left left one...

Again approaching these sentences in terms of functional wh-complexes makes the parallelism with crossover configurations impossible to miss. In (34a) I give the

structures of the sentences in (33) and in (34b) I provide for comparison standard examples of crossover configurations.

(34)   a. i. in which place$_i$ did John put every book$_j$ $[e_i^j]$

ii. which book$_i$ did John put $[e_i^j]$ in every drawer$_j$

b. i. John put every book$_j$ in its$_j$ proper place

ii. ??John put his$_j$ student host next to every invited speaker$_j$

The present account also predicts the contrast in (35), involving cases of long wh-movement:

(35)   a. who do you think that everyone invited ?

I think that John invited Sue, Paul invited Mary....

b. Who do you think invited everyone

*I think that John invited Sue, Paul invited Mary....

The relevant structures are given in (36).

(36)   a. who$_i$ do you think that$[$ everyone$_j$ invited $[e_i^j]]]$?

b. who$_i$ do you think $[[e_i^j]$ invited everyone$_j]$?

It is interesting to note that our account (unlike, for example, May's) enables us to predict this contrast without having to make the controversial assumptions that the quantifier in the embedded clause is raised all the way up to the matrix S.

Another interesting set of cases is represented by inverse linking structures such as those in (37)

(37)   a. Tell me where the mailbox of every student is

John's mailbox is here, Bill's is there, ...

b. Tell me who saw the advisor of every student

* John saw Bill's advisor, Mary saw Paul's advisor

Following May, I assume that inversely linked NP's have at LF the structure in (38a) and following Partee and Rooth (1983), I assume that these structures are interpreted as in (38b).

(38)   a. $[_{NP_k}$ every student$_j$ $[$ the mailbox$_k$ of $t_j]]$

b. $\lambda P[$every student $(\lambda x_k$ (the mailbox of x_k (P)))$] =$

$\lambda P \forall x [$student(x) $\rightarrow \exists y [$mailbox of x(y) $\wedge$ P(y)$]]$

Given these assumptions, the LF's of (37a-b) would be as shown in (39a-b) respectively:

(39)   a. where$_i$ $[_{NP_k}$ every student$_j$ $[$ the mailbox$_k$ of $t_j]]$ $[$ t_k is $[e_i^k]]$?

b. who$_i$ $[_{NP_k}$ every student$_j$ $[$ the mailbox$_k$ of $t_j]]$ $[[e_i^k]$ saw $t_k]$?

It is clear that (39b) but not (39a) induces a crossover violation. Rooth's semantics for

inverse linking yields automatically the right results. It is interesting to note that May makes different predictions in this connection. The NP every student is prevented from forming a σ-sequence with the wh-phrase by the intervening NP_k node. Hence, a pair list reading, as he explicitly notes, should always be impossible with inversely linked structures. But I find the pair list reading of (38a) impeccable.

A final interesting consequence of the present approach is that it predicts that a contrast completely parallel to the one in (1) and (2) ought to arise for non pair list functional readings. This expectation is indeed borne out:

(40)   a. Which paper did no speaker criticize? the one by his or her spouse

        b. Which speaker criticized no paper? *its author

        [meaning: no paper was criticized by its author]

The reasons for this contrast are yet again the same. The relevant structures are:

(41)   a. which $paper_i$ did no $speaker_j$ criticize $[e_i^j]$?

        b. which $speaker_i$ $[e_i^j]$ criticized no $paper_j$?

As far as I can tell, the contrast in (41) is left unaccounted for by all the theories that I am familiar with. (May (1988, fn. 2) claims that his theory does account for the contrast in (41) on grounds that the path containment condition would force the quantifier in (41b) to adjoin to VP. But at the same time he argues that the scope of VP-adjoined quantifiers extends to S. It is therefore unclear to me what would prevent it from binding the a-index of the NP trace in subject position, thereby making the functional reading of (41b) grammatical.)[9]

5. Loose ends.

There are a couple of points that I would like to address briefly before concluding. First, it should be pointed out that functional readings may involve functions of more than one argument. Engdahl (1986) discusses many examples of the following type:

(42)   to whom does every writer dedicate a book?

        to the person that inspires it to him or her

Here the relevant function maps writers and books into people. This entails, on the present account, that one must allow for more than one a-index in functional wh-complexes. It also points to the fact that such complexes must form recursive structures (such as adjunction structures, as we have assumed). The LF and semantics of (42) is given in (43):

(43)   a. to $whom_i$ every $writer_j$ a $book_k$ [t_j dedicates t_k to $[e_i^{j,k}]$]

        b. {p: p is true and for some f, p = $\forall x$ [writer(x) $\rightarrow$ $\exists y$[book(y) $\wedge$ dedicates (x,y,f(x,y))]] }

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[9] I believe that the present theory also correctly accounts for wh-quantifier interactions in psych-verbs constructions, discussed in Kim and Larson (1989). But space limitations prevent me from discussing them.

We would expect, moreover, that two- or more-place functions can also form lists, if all the quantifiers involved have a generator set. This indeed seems to be so:

(44)   a. I want to know to whom every Italian writer dedicated every book. Manzoni dedicated the "Promessi Sposi" to his wife and the "Adelchi" to Napoleon, Leopardi dedicated the "Zibaldone" to Silvia, ...

The second point I would like to address concerns the data. The contrast in (1) and (2) has been questioned on grounds that a pair list answer to, for example, (45) doesn't seem so bad:

(45)   I want to know who brought everything (so that I can thank them) Bill brought the wine, John brought the pizza, ...

In (45) WH c-commands the quantifier and thus a list reading should be ruled out. But it seems acceptable. I believe that this apparent "exception" can be understood by taking into account the fact that who is either unmarked or ambiguous with respect to number. Given this property of who, (41) will admit a representation of the form:

(46)   tell me which group X is such that $\forall y$ [X brought y]

        (where X ranges over groups)

This is not a functional reading but an individual (group-level) one. A possible answer to (46) will be:

(47)   The boys brought everything. Namely, Bill brought the wine, John brought the pizza, ...

What is going on in (47) is that even though the relevant proposition literally expresses a relation between, say, each party supply and the boys taken as a group, such a relation can be, as it where, distributed over the members of the group. This hypothesis is confirmed, I believe, by two orders of considerations. First, as noted by May and others, a pair list answer becomes impossible as soon as we either select a singular wh-phrase (like (48a)) or we otherwise disambiguate who (as in (48b)):

(48)   a. Tell me which boy brought everything

        b. Tell me who_i brought everything in his_i car

        *Bill brought the wine, John brought the pizza, ...

Second (45) disallows a (singular) functional answer:

(49)   Tell me who brought everything

        *its owner [meaning: everything was brought by its owner]

This shows that in (49) no quantificational dependency is possible between the object and the subject, as our approach predicts. The possibility of a list must indeed be an epiphenomenon vicarious on the group reading of who. Once we factor this possibility out, the contrast in (1)-(2) remains reasonably solid.

6. Conclusions.

To summarize, I have argued, following Engdahl that there is no quantification

into questions. Questions only have individual and functional readings. The so called pair list reading is a special case of the functional one. This arguably simplifies things, as extending quantification to questions (even for the limited cases in which it would be at all feasable) involves non trivial extensions of the standard quantificational mechanisms (depending on what theory of questions one adopts).

If questions are the wrong type of objects to quantify into, it follows that the observed wh-quantifier interactions cannot be a matter of relative scope, as it is instead assumed on all the accounts I am familiar with. The view of questions I have defended suggests, however, a natural alternative to such approaches. Functional wh-phrases leave behind an f-index and an a-index that must be suitably bound. And it turns out that the ungrammatical readings of questions are precisely those where binding of the a-index would give rise to a crossover violation.

What I find interesting and perhaps distinctive of this way of looking at wh-quantifier interactions is that nothing specific to them needs to be assumed. The minimal assumptions which are necessary anyway to deal with functional readings interact with independently observable constraints, such as weak crossover, to in fact predict the observable pattern of grammaticality judgements.

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