

# The Role of Topic-Hood in Multiple-Wh Question Semantics

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## 1 Introduction and background

In investigating the semantics of multiple-Wh questions, a frequently pursued methodology is to view them as special cases of single-Wh questions, and to develop an umbrella model to account for both; this approach is taken by e.g. Karttunen (1977) and Groenendijk & Stokhof (1984). One well founded motivation for this strategy is that the types of answers appropriate to multiple-Wh questions are also appropriate to certain single-Wh questions, specifically a subset of those containing quantifiers (referred to henceforth as **Wh/Q** questions). For instance, the answer listed in (1c), a so-called **pair list** answer, is equally felicitous as a response to both (1a) and (1b), despite the two questions' overt differences in structure (i.e., the choice of operators present).

- (1) a. Q: What did every student read?  
b. Q: Which student read what?  
c. A: Jesse read *Hop on Pop*, Aaron read *Green Eggs & Ham*, and Dave read *Das Kapital*.

Beginning with Hamblin (1958, 1973), the meaning of a question has been taken to be directly reflected in the propositions that can serve as its answers. This approach gives an amount of primacy to answers as the true focus of investigation – in a case like (1), the null hypothesis is that only one structure is responsible for (1c), and thus that questions (1a) and (1b) are on some level semantically equivalent. One goal of the present paper is to provide evidence from English in favor of this hypothesis. I argue below that the mechanism which licenses pair lists in English leaves telltale interpretational signs that are uniform across both Wh/Q and multiple-Wh questions. Related patterns in Japanese multiple-Wh question interpretations are substantiated by Kitagawa, Roehrs & Tomioka (2004) (henceforth KRT 2004) and Kitagawa & Tomioka (2004), who are led to nearly the same conclusions that I am.

The more general issue of how pair list answers are licensed (and blocked) has been considerably informed by insightful recent work by Szabolcsi (1997) and Krifka (2001), which I summarize below in §2. One upshot of their findings for Wh/Q questions is that, in order to be associated with a pair list answer, a single-Wh question must contain a universal quantifier construable as a discourse Topic.<sup>1</sup> Both of these properties follow from what Szabolcsi and Krifka argue a pair list to be: namely, a set of answers to a (covert) list of consecutive sub-questions. I propose that the same consecutive-question structure underlies multiple-Wh questions as well, and that their constituent Wh-operators are sensitive to the same competition over discourse Topic status. It is this Topic-hood sensitivity which I show to have observable consequences in §3, accounting for patterns in judgments of multiple-Wh felicity first investigated by Dayal (1996).

In §4 I turn to the question of how Wh-Topics receive their quantificational force. My proposal is that Wh-Topics in English are interpretable *in situ*, via binding by the speech-act operator '&'

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<sup>1</sup> This is comparable to Kuno's (1982) notion of such quantifiers being *sortal keys*.

introduced by Krifka (2001). Support for this view comes from peculiarities in the grammaticality and interpretation of an exceptional class of multiple-Wh questions studied by Pesetsky (1987) and Barss (1990, 2000), exemplified in (2), which I term **Superiority constructions**.

- (2) a. Q: ?What did which student read?  
 b. A: Jesse read *Hop on Pop*.

Barss observes that the question in (2a) seems to only entertain a **single pair** answer like (2b), rather than the usual pair list. I relate this irregularity to a suggestion by KRT (2004:14-17) that pair lists are only available when there is a clear winner among the Wh-operators for the role of discourse Topic. Given the *in situ* analysis for Wh-Topics, I argue that no such winner can emerge in (2a), thus blocking the licensing of a pair list answer.

I then briefly conclude with an overview of the issues in §5.

## 2 Sub-questions and Topics

The analyses proposed for pair list interpretations by Krifka (2001) and Szabolcsi (1997) assimilate the meaning of a Wh/Q question like (3a) to that of an explicit list of questions like (3b). The first thing to note about these two question types is that the same kinds of pair list answers are appropriate for both, as was the case in (1).

- (3) a. What did every student read?  
 b. What did Jesse read? And what did Aaron read? And what did Dave read?

This interpretation of Wh/Q questions indicates that the role of the quantifier ‘every student’ in (3a) is essentially that of a restrictor: it selects the group of people the list of questions will be about. In this sense the quantifier scopes outside of the question, thereby inducing co-variation between students and the questions asked about them. Krifka’s (2001) real innovation was in determining what the sub-questions consisted of: not bare Hamblin-style sets of propositions, which are of the wrong semantic type (i.e.,  $\langle\langle st, t \rangle\rangle$ ) to be quantified over anyway, but rather the **speech acts** produced by asking those questions. His analysis was foreshadowed by both Szabolcsi’s (1997) and Karttunen’s (1977), each of which also recognized the need to type-shift the sub-questions before they could be quantified over.

Universal quantification over a set of speech acts in Krifka’s system takes the form of consecutive performance of those acts. The resulting cumulative performance is itself a speech act, as well. Using a semantic type system that recognizes speech acts as a basic type  $\langle\langle a \rangle\rangle$ , we can define an operator to do the job of speech act quantification, which Krifka calls ‘&’:

- (4)  $\&(\{ACT_1, ACT_2, ACT_3, \dots\}) = ACT_{1\&2\&3\&\dots}$
- $ACT_{i\&j}$  refers to the act of consecutively performing  $ACT_i$  and then  $ACT_j$ .
  - ‘&’ is of type  $\langle a^+, a \rangle$ , where  $\langle \sigma^+ \rangle$  is a set of elements of type  $\langle \sigma \rangle$ .

Therefore, a Wh/Q like (3a) consists of ‘&’ applied to a set of sub-question acts, each of which asks a question about a different student. This is depicted in (5), with each of the questions’ content type-shifted to  $\langle a \rangle$  by the operator QUEST.

- (5) What did every student read?  
 =  $\&(\{QUEST(\text{what did Jesse read?}), QUEST(\text{what did Aaron read?}), QUEST(\text{what did Dave read?})\})$

A pair list answer to (3a) will simply be a list of the answers to each of the sub-questions.

The last crucial element in Krifka’s view of Wh/Q questions addresses the high-scoping universal quantifier’s role in the information structure of the sub-questions. In determining the “about-ness” of a set of speech acts, the entities introduced by the quantifier essentially function as the sub-questions’ **Topics**. Consequently, the quantifier itself necessarily takes on the role of a Wh/Q question’s discourse

Topic when it licenses a pair-list reading for that question. For the purposes of this paper, I represent this Topic function in the following simplified format for question denotations:

$$(6) \quad \text{'What did [each student]}^{\text{Topic}} \text{ read?}' \\ = \&(\{\text{QUEST}(\text{what did } e_i \text{ read?}) \mid [\text{Topic: student}]_i\})$$

*Conjunction OP    Type-shifting OP    Question content    Topic set restrictor*

Since selection of the Topic restrictor set is necessary in (6) to produce a pair list reading, we expect the *blocking* of a pair list when a Wh/Q question contains no quantifier that can be construed as a Topic. That is, the availability of pair list readings should depend on the presence of Topical quantifiers. This insight sheds much light on some puzzling features of the distribution of pair list readings across Wh/Q questions. Two of these are exemplified in (7).

- |     |    |   |                       |
|-----|----|---|-----------------------|
| (7) | a. | What did <b>everyone</b> read?                    | (✓ <i>pair list</i> ) |
|     |    | What did John give <b>everyone</b> for Christmas? | (✓ <i>pair list</i> ) |
|     |    | Who read <b>everything</b> ?                      | (* <i>pair list</i> ) |
|     | b. | Who read <b>everything</b> ?                      | (* <i>pair list</i> ) |
|     |    | Who read <b>each book</b> ?                       | (✓ <i>pair list</i> ) |

In (7a) we see that the sentence position of the universal quantifier matters, with subjects and indirect objects inducing pair lists more easily than direct objects, while (7b) reveals that pair lists are more easily licensed by lexically specific universals headed by ‘each’, even in direct object position.

As Krifka (2001) argues in detail, the data in (7) resist an explanation based on syntactic configuration, because of the back door provided by lexical specificity in (7b). (7b) shows that it is not enough to simply say that direct object universals are “too low” to license pair lists, since somehow ‘each’ is able to escape this restriction. The restriction of pair list readings to quantificational subjects, indirect objects, and lexically specific items can be attributed to each of these categories making an ideal discourse Topic. Conversely, direct objects and non-specific operators are noted for making especially *bad* Topics, and these are exactly the class of universals that cannot induce a pair list reading in a Wh/Q question. Further support for this generalization comes from the contrast in (8), showing that Focus intonation on a universal cancels an otherwise robust pair list reading.

- |     |    |   |                       |
|-----|----|---|-----------------------|
| (8) | a. | What did every student read?                | (✓ <i>pair list</i> ) |
|     | b. | What did EVERY <sub>Foc</sub> student read? | (* <i>pair list</i> ) |

Since Focus-hood is antithetical to Topic-hood, the focused quantifier in (8b) is precluded from being a Topic and inducing a pair list interpretation.

The ability of sub-question- and Topic-based explanations to make sense of such a wide range of Wh/Q question data (and more) represents strong evidence in their favor. We now turn to the question of how Krifka’s system can also be used to make sense of multiple-Wh questions.

### 3 Asymmetries in Wh-phrase interpretation

#### 3.1 Overview of strategy

The main proposal of this paper is that the same structure underlying the pair list readings of Wh/Q questions is also responsible for multiple-Wh pair list readings. That is, structure (6) for ‘what did each student read?’ is also valid for ‘which student read what?’, with a mapping as in (9).

$$(9) \quad \text{[Which student]}^{\text{Topic}} \text{ read what?}$$

$$\&(\{\text{QUEST}(\text{what did } e_i \text{ read?}) \mid [\text{Topic: student}]_i\})$$

Inherent in assigning the representation in (9) to multiple-Wh questions is that the two Wh-operators are consequently on very different semantic footing: one is a Wh-Topic, and the other is a normal question operator.<sup>2</sup> Representations like (9) capture this as a scope asymmetry, placing the Wh-Topic outside the speech act operator QUEST and the Wh-non-Topic inside it, within the question's content. We thus expect multiple-Wh questions to be interpretationally **asymmetrical**.

One way to test for this asymmetry in a given multiple-Wh question is to choose a fixed background scenario and vary which Wh-phrase wins out as the Topic, through various forms of "promotion". Different choices of Topic will lead to different question structures with different felicity conditions. Two types of Topic promotion are employed in this section: swapping subjects and objects (thereby favoring the subjects as Topics), and swapping 'which'-phrases for simple Wh-words (thus disfavoring them as Topics).

### 3.2 *Tennis match mismatches*

The context I employ here to probe the internal structure of multiple-Wh questions is adapted from Dayal (1996, 2005). The original data observations are hers, though I add my own regarding the role played by lexical specificity. Consider the following scenario.

- (10) Speaker A: We're organizing singles tennis games between men and women. There are **three men** interested in playing against the women, but there are **five women** interested in playing against the men.

Now consider the following two options for Speaker B to ask a question about the man-woman pairings.

- (11) a. Speaker B: #So, **which woman** is playing against **which man**?  
 b. Speaker B: So, **which man** is playing against **which woman**?

Dayal observes that swapping the Wh-phrases' sentence positions leads to a swap in felicity – it is felicitous to ask about men in subject position (11b), but infelicitous when the subjects are women (11a). Note that a crucial feature of scenario (10) reflects this asymmetry: women outnumber men. Dayal therefore concludes that it is infelicitous to ask a question in which the Wh-subject population outnumbers the Wh-object population. Given a wider range of data though, we can see that this sentence position-based generalization does not hold up in all cases. In particular, a similar felicity contrast shows up in (12), even though both Wh-subjects still refer to women.

- (12) a. Speaker B: #So, **which woman** is playing against **which man**?  
 b. Speaker B: So, **who** is playing against **which man**?

Example (12) shows that the felicity of a multiple-Wh question in scenario (10) is dependent on both the arrangement *and* the lexical specificity of its Wh-phrases. It is only a problem for the subjects to outnumber the objects *if the Wh-subject is a 'which'-phrase*.

This sensitivity to Wh-phrases' sentence positions and specificity is strikingly reminiscent of Krifka's (2001) discussion of universal quantifiers in Wh/Q questions, and suggests a generalization along similar lines. I claim that the correct conclusion to be drawn from (11) and (12) is that a question is infelicitous when the **Wh-Topic** population outnumbers the **Wh-non-Topic** population. This generalization can be seen at work in (13), where the questions from above have been marked for Topic-hood.

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<sup>2</sup> NB: claiming that a Wh-phrase is a discourse Topic is not the same as saying that it is Topicalized or otherwise overtly linguistically Topic-marked in any way. As McNally (1998) points out, it would be a mistake to conflate the notions of Discourse Topic and Linguistic Topic, since the two have very different empirical and ontological properties.



## 4 Superiority satisfaction *in situ*

### 4.1 Evidence from Superiority constructions

Having motivated the speech-act quantificational force of Wh-Topics in the last section, I now turn to the question of how this force is conveyed.<sup>3</sup> Two well-known options for transmitting quantificational force are open to Wh-Topics: LF movement (15a) or operator binding *in situ* (15b).<sup>4</sup>

- (15) a. LF Movement of Topic:  $\&([[ \text{which student} ]_i \text{ QUEST}([t_i \text{ read what?}]_{\text{CP}})]_{\text{TopicP}})$   
b. Operator binding of Topic:  $\&_i(\text{QUEST}([ [ \text{which student} ]_i \text{ read what?}]_{\text{CP}}))$

In this section, I consider evidence from English Superiority constructions like (2), repeated below, which I argue decides in favor of Topics receiving their quantificational force *in situ* as in (15b), via operator binding.

- (2) a. Q: ?What did which student read?  
b. A: Jesse read *Hop on Pop*.

Two observations are relevant for this discussion. The first concerns the interpretation of (2a), already mentioned in the introduction. According to Barss (1990, 2000) (2a) cannot be associated with a pair list reading – only single pair answers like (2b) are appropriate. The contribution made by this observation will be dealt with further below, after the appropriate background has been introduced.

The second observation concerns the conditions under which (2a) is grammatical. Chomsky (1973) observes that questions of the type in (2a), in which Wh-movement has skipped the underlyingly highest Wh-operator and instead moved one up from lower in the sentence, are flatly unacceptable when the skipped operator is a simple Wh-word like ‘who’, as shown in (16).

- (16) \*What<sub>i</sub> did **who** read t<sub>i</sub>?

The ungrammaticality of (16) was taken to be a violation of a syntactic condition of movement, the Superiority Condition, which forced Wh-movement to target the highest Wh-items first. Pesetsky (1987) notes, however, that the improved acceptability of (2) compared to (16) implies that the Superiority Condition is *not* violated when the skipped Wh-item is a ‘which’-phrase. His solution explains that (2a) is not a Superiority violation because ‘which student’ was never targeted for Wh-movement in the first place – it remains *in situ* throughout the derivation, and is interpreted there at LF. This leaves ‘what’ as the highest mobile Wh-word, which moves without incident.

To account for the distinct behavior of ‘which’-phrases, Pesetsky proposes a **D(iscourse)-linking** restriction on Wh-*in-situ* – only D-linked Wh-items can be interpreted *in situ*, where D-linking is understood as quantification over a set of entities that “both speaker and hearer have in mind” (1987:108). While innovative in its ability to succinctly account for the observed grammaticality distributions, the D-linking criterion does not seem to derive in any way from more basic principles; it simply emerges from the data without explanation.

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<sup>3</sup> In this context, I intend “force” to be synonymous with “scope”, due to the special discourse status of the Topics’ eventual scope position outside the speech act.

<sup>4</sup> Krifka (2001) and KRT (2004) each give formal semantic means of implementing (15a). In Willis (2007), I show how one can implement (15b) using a Hamblin semantics, with ‘which student’ at the “root” of a set of Hamblin alternatives of type  $\langle e \rangle$ . The alternative set composes with the rest of the sentence via Pointwise Functional Application (Kratzer 2005) until it has grown to an alternative set of speech acts, and is then capped off by the operator ‘&’. In the interest of saving space, I refer the interested reader to these works for the formal details rather than recapitulating them here.

## 4.2 Topic interpretation in situ

Suppose, though, that ‘&’ were the binder of Wh-*in-situ*, as depicted in (15b). If this were the case, it would require its bindee to be a Wh-Topic, since the bound Wh-item would bear interpretational scope outside the speech act. But now note that being a Wh-Topic entails being D-linked – a Topic can only be chosen, after all, if both the speaker and hearer have it in mind. The resulting generalization that Wh-*in-situ* must be a Topic therefore properly encompasses Pesetsky’s D-linking criterion. Thus, adopting representation (15b) allows us to *explain* the D-linking requirement in terms of the semantics motivated for multiple-Wh questions in §3. If Topics moved at LF as in (15a), however, then even the ameliorated Superiority construction (2a) should still constitute a Superiority violation, and the D-linking criterion would remain just as mysterious as ever. I take it as a strong support for the present system that the venerable D-linking criterion can be shown to emerge from more basic principles.

Adopting hypothesis (15b) leaves us with the Topic-marking in (17a) for the Superiority construction in (2a), with the corresponding interpretation in (17b).

- (17) a. ?What did [which student]<sup>Topic</sup> read?  
b. = &({QUEST(what did  $e_i$  read?) | [Topic: student]<sub>i</sub>})

A problem arises, though, when one considers that (17b) is *also* the hypothesized interpretation of ‘[which student]<sup>Topic</sup> read what?’. This seems wrong, because ‘which student read what?’ easily licenses a pair list reading, as opposed to the strictly single pair reading of (2a). What is responsible for this disparity?

## 4.3 Symmetrical and asymmetrical Topic selection

Rather than being a flaw with the present system, I argue that the above disparity is simply a manifestation of a principle of pair list construction argued for by KRT (2004), and ultimately stands in favor of the Wh-Topic-*in-situ* analysis pursued here. KRT point out that Krifka’s system *requires* pair list answers to be licensed by an operator asymmetry somewhere in the associated question. Specifically, since pair lists have their origin in competition over Topic-hood, it must be the case that one (and only one) operator actually *wins* the competition – there must be a unique Topic. KRT hypothesize that in a situation where there is no clear winner, the result is that a pair list reading will be blocked. Put another way, a pair list reading will be blocked if a question’s operators are **symmetrical** in their discourse status; only internally *asymmetrical* questions can license pair list readings.

According to KRT’s asymmetry view, the blocking of pair list answers in (2a) should lead us to ask two questions: (i) why isn’t ‘what’ a unique Topic? and (ii) why isn’t ‘which student’ a unique Topic? In both cases, the answer is that the uniqueness clause is violated. For different reasons, *both* Wh-operators are actively signaled as Topics, thereby blocking either one from being an unambiguous winner for Topic-hood. The logic is as follows.

In (2a), ‘what’ bears a special cue to Topic-hood not normally enjoyed by Wh-operators in English: it has been gratuitously moved to the left periphery, past the *in situ* subject. The resulting question appears in a marked OSV word order, which is otherwise only ever seen in the English topicalization construction. The particular movement of ‘what’ also was not necessitated by any obligatory rules of syntax, deepening the resemblance to topicalization, which is by its nature optional. Similar arguments concerning the effect of marked word orders on Wh-operators are made by Kuno (1982) and KRT (2004) for German and Japanese.

If this was all there was to say, then it would seem that nothing should get in the way of ‘what’ bearing Topic status uniquely and inducing a pair list answer. However, if we assume the ‘&’-binding analysis of Wh-Topic evaluation from (15b), then ‘which student’ itself has no choice but to be a Topic, since it is ineligible for Wh-movement and appears *in situ* on the surface. And in a sense, ‘which student’ has been just as “actively” forced into Topic-hood as ‘what’ has. Only in the configuration of a Superiority construction is a Wh-phrase ever verifiably skipped for Wh-movement, and the skipping movement is itself gratuitous (optional) from a syntax standpoint. In this way, both

Wh-operators give off signals of having been “selected” to be Topics by the speaker, and as a result neither can serve as a Topic uniquely. The resulting question is internally *symmetrical*, and thus cannot induce a pair list answer.

I take Superiority constructions to be strongly supportive of a non-movement analysis of Wh-Topics in English, due to the combined weight of explanation for grammaticality and interpretation. Note though, that the Superiority Condition is observed to be inactive in some languages, for instance Japanese and German.

- (18) German: ✓*Was hat wer gelesen?* (✓*pair list*)  
 what.ACC has who.NOM read  
 “Who read what?”
- Japanese: ✓*Nani-o kinoo dare-ga katta-no?* (?*pair-list*)  
 what.ACC yesterday who.NOM bought.COMP<sub>WH</sub>  
 “Who bought what yesterday?” KRT (2004:17)

In these languages, we cannot conclude that Topics are immobile as we did for English, since *Wh-in-situ* configurations are freely available to non-Topics like *wer* and *dare-ga* (both ‘who’). Indeed, KRT (2004) argue in favor of Topics being assigned scope through LF movement in Japanese, suggesting that a number of Topic scope mechanisms may be available to the world’s languages.

## 5 Conclusion

In this paper I presented evidence in favor of two primary hypotheses regarding the semantics of multiple-Wh questions in English. The first is that multiple-Wh questions are interpreted according to the same principles that Krifka (2001) shows to give rise to pair list readings for Wh/Q questions. This entails that multiple-Wh questions are internally asymmetrical and sensitive to information structure. Indeed, English evidence adapted from Dayal (1996, 2005) shows that a Wh-phrase contributes to the question’s meaning in different ways depending on whether it is the question’s Topic or not. A Wh-Topic serves as quantificational restrictor at the speech act level, while a Wh-non-Topic serves as a traditional question operator. This splitting up of Wh-items into Topics and non-Topics in a Krifka-style semantics for multiple-Wh questions has also been proposed by KRT (2004) based on Japanese question data.

The second hypothesis defended above is that the quantificational force of a Wh-Topic, represented as scope taking at the speech act level, is conveyed without recourse to LF movement, via *in situ* operator binding. Allowing that Wh-Topics are interpreted *in situ* makes it possible to derive Pesetsky’s (1987) D-linking requirement on *Wh-in-situ* from independent principles. This result is desirable, since the requirement appears otherwise unmotivated – it stops short of *explaining* the properties of Superiority constructions that it certainly succeeds in describing. Further motivation for assuming that *Wh-in-situ* is bound by a Topic operator comes from the blocking of pair list readings in Superiority constructions, as discussed by Barss (1990, 2000). Taking up a proposal from KRT (2004), I argue that these constructions’ lack of a pair list reading stems from their lack of a single clearly defined Wh-Topic. In fact, *both* Wh-phrases in a Superiority construction bear cues of Topic-hood: the fronted Wh-word by virtue of the resulting marked OSV word order, and the *Wh-in-situ* by virtue of being bound by the Topic operator ‘&’. Without a unique Wh-Topic, such questions are therefore not able to license a pair list interpretation. This result reiterates the fundamental notion of this work – namely, that pair list readings arise exclusively as a result of asymmetries in the discourse status of question operators.

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