A Unified Approach to Questions, Quantifiers and Coordination in Japanese

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1 Introduction

Universal/existential quantifiers can be seen as generalization of logical conjunction/disjunction. The universal (existential) quantification of an open proposition is the conjunction (disjunction) of all its possible instantiations. In other words, conjunction (disjunction) is a special kind of universal (existential) quantification where the domain of the variable is restricted to the set of the conjuncts (disjuncts). The Japanese language seems to reflect this logical relationship. A common way in Japanese to express universal or existential quantification is to use a *wh*-pronoun in combination with *mo* or *ka*, particles otherwise used to denote conjunction or disjunction (Let's call this quantification *wh-mo/ka*).[1] Actually, there is a strong parallelism between these two uses of the particles:

(1) a. Kare-wa ie-de-mo gakkou-de-mo asonda.
he-TOP home-LOC-*mo* school-LOC-*mo* played
'He played at home and at school.'

b. Kare-wa doko-de-mo asonda.
he-TOP where-LOC-*mo* played
'He played everywhere.'

c. Kare-wa ie-ka gakkou-ka-de asonda.
he-TOP home-*ka* school-*ka*-LOC played
'He played at home or at school.'

d. Kare-wa doko-ka-de asonda.
he-TOP where-*ka*-LOC played
'He played somewhere.'

But what are the *wh*-words doing in the quantified sentences (1b, d)? According to Ginzburg & Sag (2001, henceforth GS)'s semantic ontology, on which they base their HPSG account of English interrogatives, questions are propositional abstracts where *wh*-words correspond to abstracted arguments. If, in (1b, d), the *wh*-words are not *mo/ka*-marked and the verb is in interrogative form, we have an ordinary *wh*-question:

(2) Kare-wa doko-de asonda-ka?
he-TOP where-LOC played-Q
'Where did he play?'

and its denotation, in GS's view, is

(3) $\lambda\{x\}$[[he played at x]]

The fact that (3) is exactly the open proposition quantified in (1b, d) leads us to think that the semantics of questions, quantifiers and coordination in Japanese should be consistently accounted for by the semantic contribution of the particles *mo/ka* and of *wh*-words. In this paper, we present such an analysis in HPSG.[2]

[1] There are other languages where universal/existential quantification is expressed by a *wh*-word and a conjunctive/disjunctive particle. See, for example, Gill et al. (2004).

[2] Hagstrom (1998) further identified the disjunctive particle *ka* with the question marker *ka* and tried to analyze them uniformly as existential quantification over choice functions. We do not take this view, however, since the disjunctive particle *ka* and the question marker *ka* are a nominal suffix and a suffix to finite verbs respectively, and nominal suffixes and suffixes to finite verbs generally belong to different categories in Japanese.

2 Framework

Before proceeding with the analysis, let us first outline our general framework for representing the semantics of question and quantification in HPSG.

GS introduced a separate semantic type, *question*, for the contents of interrogative clauses. The type *question* has the feature PARAMS, "the *wh*-phrase analogue of QUANTS" (GS 2001:121), whose value is a set of *params*, "restriction-bearing indices" (GS 2001:121), which correspond to the abstracted arguments of the propositional abstract – the *wh*-words in the clause. In their framework, questions are semantically distinguished from other clauses by their contents being of type *question*. So even polar questions, questions with no arguments abstracted, can be distinguished as questions, only with empty PARAMS.

However, this treatment of polar questions is not without problems. GS define the conjunction of propositional abstracts as the conjunction of the corresponding propositions with the set of abstracted arguments being the union of the sets of abstracted arguments of the conjuncts (see GS 2001:110 for details). But in this way, if a polar question is conjoined with other questions, what is asked in the polar question is lost. For example, the denotation of (4a) and (4b) will be the same, that is, (4c).

(4) a. whether it is good and whether it is cheap

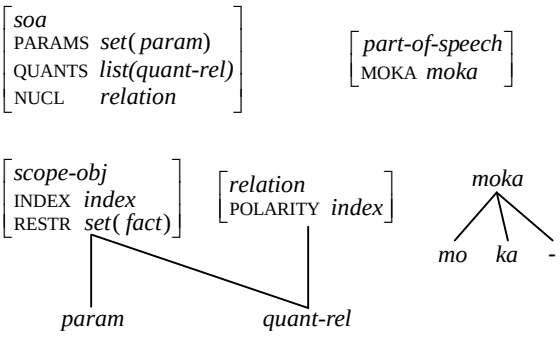
b. whether it is good and cheap

c. $\lambda\{\}(\text{Good}(i)\wedge\text{Cheap}(i))$

One way to solve this is to regard the polarity as an argument and to abstract it in polar questions.[3] To implement this solution, in our framework, the type *rel(ation)* has the feature POL(ARITY), whose value is of type *index*. The POL of a relation indicates whether the relation holds or not. For example, a negative declarative sentence's matrix verb[4] whose CONT|NUCL|POL is *i* has *negative*(*i*) in its BACKGROUND[5] to indicate that the verb's polarity is negative. The POL value is of type *index* so that it can be abstracted. In polar questions, this index is converted to a parameter with the restriction of being a polarity and put in the PARAMS set.

As a byproduct of this solution, we do no longer need a separate semantic type for questions, for questions can now be distinguished simply by their PARAMS being non-empty: in our framework, we do not have the type *question* and instead PARAMS is made a feature appropriate for *soa*. In this way, PARAMS is more "analogue of QUANTS", as PARAMS and QUANTS are both features of *soa*, and questions and quantified clauses are distinguished from other clauses respectively by PARAMS's and QUANTS's being non-empty.

Also, in our framework, the type *part-of-speech* has the feature MOKA, whose value is of type *moka*. The type *moka* has three subtypes: *mo*, *ka*, and -. A word's HEAD|MOKA is *mo* and *ka* when the word is marked (suffixed) by the particle *mo* and *ka* respectively and otherwise it is -. Parts of the type hierarchy of our framework are shown below.



Here is a rough idea of how the semantics of question and quantification works in this framework. *Wh*-words contribute as abstracted parameters. In *wh*-questions, they go into PARAMS to indicate that they are inquired. In *wh-mo/ka*, they go into QUANTS, after converted to *quant-rels* (*every-rel* in *wh-mo* and *some-rel* in *wh-ka*), to indicate that they are quantified.

[3] There are other reasons to prefer this solution. First, the PARAMS set can be thought of as the set of inquired information and in a polar question, something is surely asked – the truth-value of the clause. Second, in English, there is a *wh*-word, *whether*, for this argument, as can be seen in (4a, b). Third, and most important for this paper, this polarity argument can be quantified: 'no matter wh...' construction is the English counterpart of Japanese *wh-mo*, and *whether* can be quantified as in 'no matter whether ...'

[4] Throughout this paper, I use the term 'verb' to refer to verbs and adjectives.

[5] We will see the constraint to achieve this in section 4.1.

3 Data and Analysis

In *wh-mo/ka*, the particles *mo/ka* do not always mark the *wh*-word. Especially, *mo* can mark any verbal dependent[6] containing the *wh*-word.[7] Thus, there are sentences that differ only in the position of *mo* and in such cases, different positions of *mo* can lead to different meanings:

(5) a. Kujyo-ga kare-kara kuru-to
complaint-NOM he-from come-COND
komaru.
I hate it
'I hate it if he complains.'

b. Kujyo-ga dare-kara-mo kuru-to
complaint-NOM who-from-*mo* come-COND
komaru.
I hate it
'I hate it if everyone complains.'

c. Kujyo-ga dare-kara kite-mo
complaint-NOM who-from come-COND-*mo*
komaru.
I hate it
'I hate it if someone complains.'

d. Kujyo-ga dare-ka-kara kuru-to
complaint-NOM who-*ka*-from come-COND
komaru.
I hate it
'I hate it if someone complains.'

Examples (5b-d) are the same as (5a), except that the argument 'kare' is abstracted and quantified by *wh-mo/ka*. Examples (5b) and (5d) differ in whether the *wh*-word is marked by *mo* or by *ka*, and accordingly their meanings differ in whether the antecedent is quantified universally or existentially. Examples (5b) and (5c) differ only in the position of *mo* but their meanings are so different that (5c)'s meaning is the same as (5d)'s.

[6]By a verbal dependent, I mean a dependent of a verb, and by saying that a dependent is marked by *mo/ka*, I mean that the head word of the dependent is marked (suffixed) by *mo/ka*.

[7]On the other hand, *ka* usually marks *wh*-words directly and there are cases where such *ka*-marked *wh*-words are not verbal dependents. In this paper, however, we concentrate on the cases where *ka*-marked *wh*-words make verbal dependents.

It has been noted in the literature (e.g., Yatsushiro 2001) that *mo* marks the scope of the universal quantifier. Considering that *mo* always marks a verbal dependent, we propose the following principle of quantification to explain the semantics of *wh-mo/ka*: for each *mo/ka*-marked dependent of a verb, some of the *wh*-words in it can be universally/existentially quantified for the verb.[8] It follows from this principle that the quantified clause is the antecedent in (5b, d) and the matrix sentence in (5c). We get the following denotations for (5b-d):

(6) a. $(\forall x, x$ complains$) \rightarrow$I hate it

b. $\forall x, (x$ complains$\rightarrow$I hate it)

c. $(\exists x$ s.t. x complains$) \rightarrow$I hate it

As (6b) and (6c) are logically equivalent, these denotations match the actual interpretations of (5b-d).

The principle says that *some* of the *wh*-words in a *mo/ka*-marked dependent are quantified. This is because, while *ka* usually marks the *wh*-words directly and such *ka*-marked *wh*-words can only be quantified for the word of which the *wh*-word is a dependent, *mo* can mark any dependent of a verb, which may contain two or more *wh*-words, and not all *wh*-words there are necessarily quantified for the verb. The following example illustrates this point.

(7) a. Dare-mo nani-mo iwanai.
who-*mo* what-*mo* say-NEG
'Nobody says anything.'

b. Dare-ga nani-o itte-mo
who-NOM what-ACC say-COND-*mo*
kinisi-nai.
care-NEG
'No matter who says what, I don't care.'

c. Dare-ga nani-o itte-mo
who-NOM what-ACC say-COND-*mo*
kinisi-nai-noka?
care-NEG-Q

[8]By saying that a *wh*-word w is quantified for a verb v, I mean that w is quantified as a variable of the open proposition which the maximal projection of v denotes. In our HPSG framework, it means that the *quant-rel* made from the parameter which w denotes goes into the QUANTS of the *soa* which v denotes.

d. John-ga nani-o itte-mo
John-NOM what-ACC say-COND-*mo*
kinisi-nai.
care-NEG
'No matter what John says, I don't care.'

Although both (7a) and (7b) have two *wh*-words universally quantified by *wh-mo*, *mo* appears only once in (7b) and twice in (7a). This is because, while, in (7a), the two *wh*-words are two separate dependents of the verb for which they are quantified, (7b) is an example where the two *wh*-words are contained in one dependent of the verb for which they are quantified.

Example (7c) is the same as (7b) except that the matrix verb is marked by a question marker. Unlike (7b), however, (7c) has an interesting grammatical ambiguity. There are four interpretations of (7c) as each of the two *wh*-words can either be quantified by *wh-mo* or be questioned by the question-marker. Although, out of context, the default interpretation of (7c) would be as a polar question, where the two *wh*-words are both quantified ('Don't you care no matter who says what?'), other interpretations are possible. For example, the interpretation that the first *wh*-word 'dare' is questioned and the second, 'nani', is quantified ('No matter what WHO says, you don't care?') is natural as a reprise question to (7d).[9]

Such an ambiguity can be explained as the result of interaction between the above-mentioned principle of quantification and the following principle of question: for each verb in interrogative form (VFORM being *interrogative*), some of the *wh*-words in its maximal projection can be questioned for it. Of course, all *wh*-words must be either quantified or questioned once, and only once, somewhere. But when *mo*/*ka* and question-markers co-occur, as in (7c), or when a verb phrase is embedded in another, there can be choices whether the *wh*-words are questioned or quantified and for which verb. In our HPSG framework, these different choices are represented by whether the parameters go into PARAMS or QUANTS and which *soa*'s PARAMS/QUANTS they go into.[10]

3.1 coordination

As we noted in the introduction, conjunction (disjunction) is a special kind of quantification, where the domain of the variable is restricted to the set of conjuncts (disjuncts). Marked by *mo*, (1a) and (1b) are both examples of universal quantification that differ only in the domain of the variable. In (1b), the *wh*-word 'doko' implies that the domain is the set of places. In (1a), the conjunction implies that the domain is the set of its conjuncts, that is, {*home*, *school*}. So, we analyze a coordinated phrase in the same way as a *mo*/*ka*-marked *wh*-word, that is, as a parameter, except that the domain is restricted to its conjuncts and that it can only be quantified for the verb of which it is a dependent, not questioned.

In a coordinated phrase, conjuncts (disjuncts) must have compatible syntactic categories whose MOKA values are not -. When they are marked by *ka*, the coordinated phrase must have at least two disjuncts. A *mo*-marked coordinated phrase, on the other hand, may consist of one conjunct (or more).

4 Formalization

In this section, we formalize our analysis so far in our HPSG framework.

4.1 Parameter Amalgamation

Parameters are propagated via the STORE feature, a head feature whose value is a set of *params*. The STORE of a word designates the parameters in the word's maximal projection that are yet to be quantified/questioned. Parameters originate in the STORE

[9] Out of context, however, interpretations other than as a polar question would be unnatural. We leave it to future work to discuss exactly in what context such interpretations can be natural, that is, what pragmatic constraints are to be imposed when not all free *wh*-words in a *mo*-marked verbal dependent are quantified for the verb. Cf. footnote 10.

[10] Previous works such as Shimoyama (to appear) claim the existence of *wh*-island effect in Japanese to the effect that all, not some, free *wh*-words in a *mo*-marked verbal dependent are quantified for the verb and all, not some, of the remaining *wh*-words in an interrogative verb's maximal projection are questioned for the verb, thus accepting only the interpretation as a polar question for (7c). Let us call those interpretations that obey *wh*-island effect X and those that don't Y. Our attitude is that, although X and Y may carry different pragmatic constraints, both are grammatical. Note that, although our implementation in this paper accepts both X and Y, it is easy to distinguish X and Y in our framework. Our implementation can easily be modified to accept only X, and it should also be easy to modify it to impose certain pragmatic constrains only for Y, while Shimoyama's analysis can essentially only accept X. Cf. footnote 9.

values of *wh*-words and of coordinated phrases, and each word amalgamates its arguments' STORE values (we ignore adjuncts in this paper), putting those parameters that are quantified/questioned for the word into its PARAMS/QUANTS and others into its STORE, which is then inherited up the tree as a head feature. In this way, each parameter is guaranteed to be either quantified or questioned, at most once. To implement this amalgamation, we introduce two new features appropriate for the type *synsem*, namely TO-QUANTIFY and TO-QUESTION, whose values are sets of *params*. The TO-QUANTIFY and TO-QUESTION of a word w_1 are disjoint subsets of w_1's STORE and designate, when w_1 becomes a dependent of another word w_2, what parameters in w_1's STORE will be quantified and questioned for w_2. In the amalgamation, each word refers to its arguments' TO-QUANTIFY and TO-QUESTION values to decide its own QUANTS, PARAMS and STORE. Conditions on what parameters can be quantified/questioned in what circumstances are written as constraints on these features. Constraints in Figure 1 are the formal implementation of the propagation and retrieval of parameters, based on our analysis in the previous sections.

Implemented in (e) is the lexical amalgamation of STORE. The STORE of a word whose content is not of type *soa* is simply the union of its arguments' STORE values. When the content of a word is of type *soa* (that is, when the word is a verb), the parameters in the arguments' TO-QUANTIFY and TO-QUESTION values go to the word's QUANTS and PARAMS respectively, and the rest of the parameters in the arguments' STORE values go to the word's STORE. Note that the contained difference operation, $s_i \dot{-} q_i \dot{-} p_i$, in constraint (e) constrains each argument's TO-QUANTIFY and TO-QUESTION (q_i and p_i) to be disjoint subsets of the argument's STORE (s_i).

When the parameters in the arguments' TO-QUANTIFY values go to the word's QUANTS, they are converted, by the function f, to *quant-rels* according to the arguments' MOKA values and ordered into a list to specify the scope order.[11] Constraint (a) requires that only parameters from *mo*/*ka*-marked arguments can be quantified.

(a) $\begin{bmatrix} word \\ \text{MOKA} \ \text{-} \end{bmatrix} \Rightarrow \left[\text{TO-QUANTIFY} \ \{\}\right]$

(b) $\begin{bmatrix} word \\ \text{VFORM} \ \neg interrogative \end{bmatrix} \Leftrightarrow \left[\text{PARAMS} \ \{\}\right]$

(c) $root \Rightarrow \left[\text{STORE} \ \{\}\right]$

(d) $\left(\begin{bmatrix} word \\ \text{MOKA} \ ka \end{bmatrix} \vee \left[\text{STORE} \ \{\left[\text{RESTR} \ \in\right]\}\right]\right) \Rightarrow \begin{bmatrix} \text{STORE} & \boxed{1} \\ \text{TO-QUANTIFY} & \boxed{1} \end{bmatrix}$

(e) $word \Rightarrow /\left(\begin{bmatrix} \text{STORE} & \bigcup_{i=1}^{n} s_i \\ \text{CONT} & \neg soa \\ \text{ARG-ST} & \langle [\text{STORE} \ s_1], \cdots, [\text{STORE} \ s_n] \rangle \end{bmatrix} \vee \begin{bmatrix} \text{STORE} & \bigcup_{i=1}^{n} (s_i \dot{-} q_i \dot{-} p_i) \\ \text{CONT} & \begin{bmatrix} soa \\ \text{QUANTS} & \texttt{order}(\bigcup_{i=1}^{n} f(m_i, q_i)) \\ \text{PARAMS} & \left(\bigcup_{i=1}^{n} p_i\right) \vee \{\begin{bmatrix} param \\ \text{INDEX} & \boxed{1} \\ \text{RESTR} & polarity(\boxed{1}) \end{bmatrix}\} \\ \text{NUCL} & [\text{POLARITY} \ \boxed{1}] \end{bmatrix} \\ \text{ARG-ST} & \left\langle \begin{bmatrix} \text{STORE} & s_1 \\ \text{TO-QUANTIFY} & q_1 \\ \text{TO-QUESTION} & p_1 \\ \text{MOKA} & m_1 \end{bmatrix}, \cdots, \begin{bmatrix} \text{STORE} & s_n \\ \text{TO-QUANTIFY} & q_n \\ \text{TO-QUESTION} & p_n \\ \text{MOKA} & m_n \end{bmatrix} \right\rangle \end{bmatrix}\right)$

$f(\boxed{1}, \{x_1, \cdots, x_n\}) = \{g(\boxed{1}, x_1), \cdots, g(\boxed{1}, x_n)\},$

$g(mo, \begin{bmatrix} param \\ \text{INDEX} & \boxed{1} \\ \text{RESTR} & \boxed{2} \end{bmatrix}) = \begin{bmatrix} every\text{-}rel \\ \text{INDEX} & \boxed{1} \\ \text{RESTR} & \boxed{2} \end{bmatrix}, g(ka, \begin{bmatrix} param \\ \text{INDEX} & \boxed{1} \\ \text{RESTR} & \boxed{2} \end{bmatrix}) = \begin{bmatrix} some\text{-}rel \\ \text{INDEX} & \boxed{1} \\ \text{RESTR} & \boxed{2} \end{bmatrix}$

(f) $\begin{bmatrix} word \\ \text{POL} \ i \end{bmatrix} \Rightarrow \left(\begin{bmatrix} \text{PARAMS} & \{[\text{RESTR} \ polarity]\} \\ \text{ARG-STR} & \langle [\text{TO-QUESTION} \ \{\}], \cdots [\text{TO-QUESTION} \ \{\}] \rangle \end{bmatrix} \vee \begin{bmatrix} \text{PARAMS} & \neg\{[\text{RESTR} \ polarity]\} \\ \text{VFORM} & negative \\ \text{BCKGRD} & \{negative(i)\} \end{bmatrix} \vee \begin{bmatrix} \text{PARAMS} & \neg\{[\text{RESTR} \ polarity]\} \\ \text{VFORM} & \neg negative \\ \text{BCKGRD} & \{positive(i)\} \end{bmatrix}\right)$

($\dot{-}$ denotes contained difference)

Figure 1

When the word is not in interrogative form, constraint (b) restricts the word's PARAMS to be empty, thus restricting, in combination with constraint (e), every argument's TO-QUESTION to be empty. It is the case of a declarative clause. When the word is interrogative form and the arguments' TO-QUESTION values are all empty, constraint (b) requires the word's PARAMS to be non-empty and then constraint (e) requires, as arguments' TO-QUESTION values are all empty, the word's PARAMS to be its parameterized polarity (in this paper, we are not concerned with the possibility of semantic difference between positive and negative polar questions). It is the case of a polar question. Otherwise, as some of the arguments' TO-QUESTION values are non-empty, it follows from constraint (f) that the word's PARAMS is

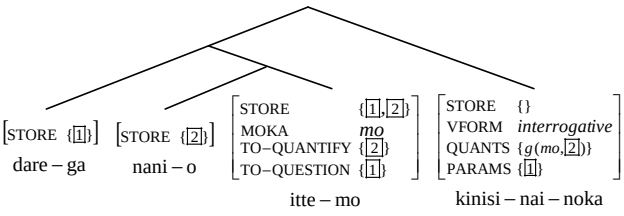
[11] Actually, just ordering them is not enough, because no two parameters from the same daughter can have a parameter from another between them in the scope order. We do not address this issue in this paper, but it can be dealt with by a slight modification to constraint (e).

not its parameterized polarity and then constraint (e) requires the word's PARAMS to be the union of the arguments' TO-QUESTION values. It is the case of a *wh*-question. Constraint (f) also requires that, when it is not the case of a polar question, the polarity of the word be specified in its BACKGROUND according to its VFORM.

As we have seen in the previous section, coordinated phrases and *ka*-marked parameters can only be quantified immediately. It is implemented in (d). Note that, as we will see below, the RESTR value of the parameter that a coordinated phrase represents is a singleton set whose only member is of type $\in$.

Lastly, constraint (c) requires every parameter to be questioned or quantified somewhere.

Below is a brief illustration of how (7c)'s interpretation as a reprise question to (7d) can be accepted in our system.



4.2 Coordination rule

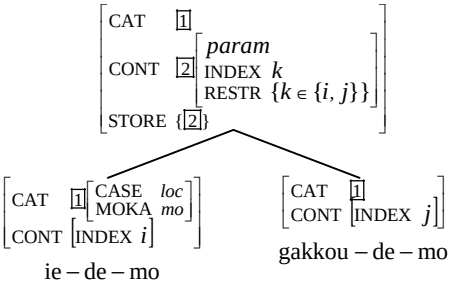
Coordinated phrases are licensed by the following grammar rule:

$$\begin{bmatrix} \text{CAT} & 1\begin{bmatrix}\text{HEAD|MOKA } ka \vee mo\end{bmatrix} \\ \text{CONT} & 2\begin{bmatrix} param \\ \text{INDEX } i \\ \text{RESTR } \{i \in \{s_1,\cdots,s_n\}\}\end{bmatrix} \\ \text{STORE} & \{2\} \end{bmatrix} \rightarrow \begin{bmatrix}\text{CAT } 1 \\ \text{INDEX } s_1\end{bmatrix} \cdots \begin{bmatrix}\text{CAT } 1 \\ \text{INDEX } s_n\end{bmatrix}$$

($n \geq 2$ when **MOKA** is *ka*, and $n \geq 1$ when **MOKA** is *mo*.)

The mother has a parameter in its STORE and the parameter has only one relation, of type $\in$, in its RESTR. $\in$ is a relation that takes two arguments, an index and a set of indexes and denotes that the former is a member of the latter. Here, it is briefly represented as $x \in y$ where x is the index and y is the set of indexes.

Below is an illustration of how (1a)'s coordinated phrase is realized in our system.



5 Conclusion

Inspired by the syntactic and semantic parallelism found in Japanese between coordination and quantification (as expressed by *wh*-words in combination with *mo*/*ka*, the conjunctive/disjunctive particles), and between quantification and question, we have investigated how these constructions are uniformly analyzed, in our HPSG framework, as cases where a parameter, denoted by a wh-word or a coordinated phrase, is questioned or quantified for a predicate, and we have presented an HPSG formalization of the analysis. Our analysis can account for, among other things, the quantifier scope as marked by the position of the conjunctive particle and the interaction between question and quantification.

Reference

Gill, K. H., Harlow, S., and Tsoulas, G. (2004). Connectives, Indeterminates, and Quantificational Variability, In O. Bonami, P. C. Hofherr (eds.), *Empirical Issues in Formal Syntax and Semantics 5*, pp. 75-88.

Ginzburg, J. and Sag, I. A. (2000). *Interrogative Investigations: The Form, Meaning, and Use of English Interrogatives*. CSLI Publications, Stanford.

Hagstrom, P. (1998). *Decomposing Questions*. Doctoral Dissertation, MIT.

Manning, C. D., Sag, I. A., and Iida, M. (1999). The Lexical Integrity of Japanese Causatives. In R. D. Levine and G. M. Green (eds.), *Studies in Contemporary Phrase Structure Grammar*, Cambridge University Press, pp. 39-79.

Pollard, C. J. and Sag, I. A. (1994). *Head-Driven Phrase Structure Grammar*. The University of Chicago Press, Chicago.

Pollard, C. and Yoo, E. J. (1998). A Unified Theory of Scope for Quantifiers and Wh-phrases, *Journal of Linguistics* 34, pp. 415-445.

Przepiórkowski, A. (1998). 'A Unified Theory of Scope' Revisited: Quantifier Retrieval Without Spurious Ambiguities, In G. Bouma, G. M. Kruijff, and R. T. Oehrle (eds.), *Proceedings of FHCG-98, 14-16 August 1998*, Saarbrücken, pp. 185-195

Sag, I. A.,Wasow, T., and Bender, E. M. (2003). *Syntactic Theory: A Formal Approach*. CSLI Publications, Stanford.

Shimoyama, Junko. (To appear). Indeterminate phrase quantification in Japanese, to appear in *Natural Language Semantics*

Yatsushiro, Kazuko. (2001). The Distribution of mo and ka and its Implications, in M. C. Cuervo, D. Harbour, K. Hiraiwa, and S. Ishihara (eds.), *Formal Approaches to Japanese Linguistics 3*, MIT, pp. 181-198.