On the Interpretation of Floating Numeral Quantifier Constructions in Japanese

大阪府立大学博士学位論文

On the Interpretation of Floating Numeral Quantifier Constructions in Japanese

（日本語の遊離数量詞構文の解釈について）

大阪府立大学大学院　人間社会学研究科

Kenji Yokota

横田　賢司

２０１３年３月

A Doctoral Dissertation
submitted to the Graduate School of Humanities and Social Sciences,
Osaka Prefecture University

Thesis Committee:

Professor Lawrence Schourup (Chair)
Professor Sachiko Takagi
Professor Yumi Takagaki
Associate Professor Kiyota Hashimoto
Professor Kei Yoshimoto (Tohoku University)

On the Interpretation of Floating Numeral Quantifier Constructions in Japanese

Kenji Yokota

Abstract

This dissertation deals with Japanese floating numeral quantifier (FNQ) constructions of particular kinds and provides an integrated analysis of these constructions focusing on their distribution and interpretation. The dissertation is organized as follows: **Chapter 1** briefly introduces Japanese FNQ constructions and presents the objectives of the study. **Chapter 2** reviews the pertinent literature and introduces basic assumptions necessary for the alternative analysis of FNQ sentences to be developed. **Chapter 3** discusses major interpretive issues (i.e., ambiguity and intonation) and related unsolved problems. In describing the basics of FNQ interpretation to facilitate subsequent explanations, it is suggested that FNQs cannot be described by looking at syntactic structure alone; rather, it is necessary to examine the process of structure building and the interaction between prosody and information structure. In Chapters 4 and 5 this hypothesis is shown to be plausible. **Chapter 4** focuses on the syntax and semantics of FNQ interpretation. Based on various interpretive facts, FNQs are classified into two types (NP-related and VP-related) and it is posited that FNQs are potentially ambiguous in the sense that semantics generates possible readings and preference is then determined by discourse pragmatics (e.g., information structure and prosody). **Chapter 5** focuses on the relationship between information structure and prosody, which is closely related to the interpretation of FNQ sentences. It is argued that information structure influences the position of an FNQ and its interpretation by way of prosody. The results of a perception test are adduced to corroborate this assumption. **Chapter 6** presents a formal analysis within CCG (Combinatory Categorial Grammar) that can straightforwardly handle FNQ interpretation. This theory permits the proper description of the syntactic, semantic, and pragmatic (e.g., informational and prosodic) aspects of Japanese FNQ constructions. **Chapter 7** summarizes the earlier discussion and offers concluding remarks.

Table of Contents

CHAPTER 1

Introduction

This dissertation deals with Japanese floating numeral quantifier (hereafter FNQ) constructions of particular kinds and provides an integrated analysis of these constructions focusing on their distribution and interpretation. The first chapter provides background on Japanese FNQ constructions and sets forth the objectives of the study. FNQ constructions have been the subject of much research in linguistics and their grammatical behavior has presented serious challenges to all grammatical theories. By elucidating the roles of information structure and prosody, which are assumed to affect sentence interpretation, we argue that FNQs in Japanese, which have long been analyzed as purely syntactic phenomena, are sensitive to discourse relations.[1,2] More specifically, it is shown that the interpretation of FNQ sentences should be handled in terms of syntax, semantics, and pragmatics (i.e., information structure and prosody). This can be formalized in the CCG framework in a straightforward manner.

1.1 Overview of Japanese FNQ constructions

It is well known that Japanese is a language that allows for the relative freedom of grammatical elements within the sentence. FNQ constructions

[1] The term *float* does not have a precise, self-evident definition. Essentially, we use it as a convenient label (or a figurative expression) for the FNQ phenomenon, partly because it is widespread in the literature.

[2] Hogan (2011: 387) defines *information structure* as the organization of elements within a sentence according to their pragmatic contribution (givenness-newness and theme-rheme) in a piece of discourse or text, as opposed to their syntactic role (e.g., subject and object) or semantic role (e.g., agent, goal, and beneficiary). An element's degree of importance, or salience, influences its linguistic realization; in particular, it affects grammatical choices (e.g., word order and voice), prosodic choices (e.g., choice of intonation contours and placement of sentential stress), and lexical choices (e.g., definiteness, ellipsis, pronominalization, and use of specific particles). Chapter 5 provides an in-depth discussion of information structure relevant to FNQ interpretation.

exemplify this and are quite common in Japanese (see (1.1) b, c). As the name implies, the NQ appears to "float" away from its position ((1.1) b, c), despite its construal with the host noun *gakusei*.[3] Syntactically, a numeral classifier (e.g., *san-nin* three-Cl) appears either as a local or non-local quantifier, as shown in ((1.1) b) and ((1.1) c), respectively. The NQ *san-nin* 'three-Cl' in ((1.1) a) is NP-internal and accompanied by the genitive marker *-no,* thus quantifying the host noun *gakusei* 'student'.[4] Let this type be a non-FNQ; this paper does not concern this paradigm. Unlike non-FNQs, an FNQ does not occur in its expected standard position of a noun determiner. In the examples below, the quantifier has been *italicized* and its host noun **boldfaced**. The abbreviation Cl stands for classifier.

(1.1)

a. *San-nin* no **gakusei ga** kita. (NQ is not floated.)
   3-Cl Gen student Nom came
   'Three (and no more) students came.'

b. **Gakusei ga** *san-nin* kita. (Local-FNQ)
   student Nom 3-Cl came
   'Three (of the) students came.'

c. **Gakusei ga** kinoo/koremadeni *san-nin* kita. (Non-local FNQ)
   student Nom yesterday/so far 3-Cl came
   'Three (of the) students came yesterday/have come so far.'

This study focuses on subject-oriented (or subject-related) FNQ sentences in Japanese, as illustrated in ((1.1) b, c). Unless indicated, all

[3] Generally, a Japanese pronominal quantifier is post-positioned by *no*. Kuno (1973) notes that this *no* is the attributive form of the copula *da*, not the genitive case marker (Kobuchi 2007: 6).

[4] This paper does not concern the nature of ((1.1) a), but simply states that there is a systematic relationship between ((1.1) a) and ((1.1) b). For instance, the sets individuated by pre-nominal NQ phrases are subject to further individuation, whereas those individuated by FNQ phrases are not. The matter, however, is not that simple (see (1.2) and section 4.2.8 (Chapter 4)) (Kamio 1977; Inoue 1978; Miyagawa 1989; Fukushima 1991; Gunji and Hasida 1998b; Kobuchi 2003; Shimojo 2004; Kuroda 2008, among many others).

examples cited in the study revolve around Japanese subject-oriented FNQ sentences, wherein the host noun (the subject) bears the nominative marker *-ga*; the nominative marker is generally assumed to signal the separation of the FNQ from the host noun.[5]

Semantically, the NQ *san-nin* 'three-Cl' in ((1.1) a) occurs inside an NP (or DP), implying that we are referring to a set or complete group in a salient context. In contrast, the NQ follows the particle *-ga* in ((1.1) b) and ((1.1) c), which indicates that we are referring to any three students, rather than a particular set of students or a partitive subset of a larger set, that is, a part of the whole (McClure 2000: 253-4). However, we must investigate whether the interpretation (or processing) of the sentence's meaning is influenced by non-syntactic factors: this is a question which has been largely neglected in the relevant literature. What if sentences ((1.1) b) and ((1.1) c) were presented in their respective contexts?

Additional research about contextual factors that may affect FNQ construal is necessary, especially with regard to prosodic influence on FNQ interpretation. The following discussion emphasizes the role of prosody. Prosody plays a vital role in encoding information structural relations such as focus, topic, and background (see Lambrecht 1994; Butt and King 2000; Steedman 2000a, b; Dalrymple and Nikolaeva 2011 for more discussion).[6] This study is designed to provide an account of prosodic interaction with syntax and information structure by examining how prosody helps to determine the information structure roles imposed by context such as focus, topic, and background in FNQ sentences.[7,8]

---

[5] A close examination of intonational patterns observed in FNQ sentences shows that this is not always the case (see section 5.3 (Chapter 5)).

[6] The terms *prosody* and *intonation* are commonly used interchangeably in the literature. This study also follows this convention. Often, the term *prosody* will refer to the underlying prominence and constituent structure of speech, while *intonation* will refer to the realization of this structure by acoustic means, primarily pitch variation (see Pierrehumbert and Beckman 1988, and Beckman 1996 for details).

[7] We assume that information structure is the key for understanding FNQ sentences and offers a fresh picture of how structure and intonation fit together. Here, information conveyed by prosodic features is communicated in the sense of Grice's (1975) theory of

To outline the basic structure of FNQ sentences, we consider (1.2), wherein the meaning of the FNQ sentence (e.g., (1.1) b, c) is essentially the same as that of a non-FNQ sentence (e.g., (1.1) a). It is noteworthy that in these cases the floating quantifier generally preserves a logical and invariant meaning as seen in (1.2).

(1.2)

San-nin no **gakusei ga**	hataraite-iru.	⇔	**Gakusei ga** *san-nin*	hataraite-iru.
3-Cl Gen students Nom	working-are		'students are, three of them, all	
'three (of the) students are working'			working'	

(Kuroda 2008: 132)

This relation implies that, in all likelihood, the choice between the use of an FNQ and non-FNQ structure is not random, but determined by factors including the speaker's communicative needs.[9] Given that we rarely encounter sentences devoid of context, it is highly probable that the use of an FNQ construction is constrained by the fact that the FNQ is interpreted in relation to the discourse information available.[10] (We return to this issue in section 4.2.5 (Chapter 4).)

To account for the grammatical behavior of FNQs as outlined thus far,

---

meaning, wherein one is not concerned with the question of how expressions acquire their meaning, but rather with the distinction between what is said and conveyed or implied (Hogan 2011: 330). Adopting this definition, this study concentrates on a particular notion of prosodically marked focus and refers to an item carrying emphatic new information, such as that was studied in detail in Jackendoff (1972).

[8] Following Kadmon (2001: Chapter 13), we assume that the "highlighting" or "marking as unexpected" role of pitch accents is the most important factor in prosody-based focus identification. It should be given a more central place in theory than those given in Ladd (1980) and Selkirk (1984, 1995), which simultaneously grant lesser significance to the role of syntactic and lexical factors.

[9] In a study of intonation and its uses, Bolinger (1989) states that it is a matter of conscious or unconscious choice, of favoring some patterns over others and of preferences in how to perform them, the latter being the domain of gradient differences: prolonging an accent, levelling off instead of going higher or lower, realizing a drop within a syllable rather than after it, and so on (Bolinger 1989: 9).

[10] There may be stylistic reasons why one order is preferred to another, especially in sentences describing sequences of actions or events (cf. Kuno 1978, 1980).

we propose that in Japanese there is more than one type of FNQ—NP-related and VP-related FNQs — both of which exhibit distinctive intonations and prompt varying interpretations. More specifically, in sentence interpretation, the FNQ is associated with either the subject NP (adnominal FNQ) or the verb (adverbial FNQ), especially when contextual or prosodic information is not readily available.

Even though they possess different internal structures, on the surface, the order of words appears identical in both constructions, resulting in syntactic ambiguity. To consider the problem of ambiguity, the central topic in this study, we investigate in detail the factors determining the position occupied by the FNQ when there are multiple "bracketing" possibilities. More specifically, given that information structure roles are in some sense aligned with phrase structure constituents in Japanese, (Selkirk 1990, 1995; Steedman 1996, 2000a, b) prosody determines the choice of structure (or bracketing) and controls the information structure roles of constituents. In general, prosodic disambiguation is very common in natural speech (see Schafer et al. 2000a, b and references therein). In regard, one problem with most existing studies is the presentation of isolated FNQ sentences with differing prosody, which is based on the researchers' intuition.

By way of illustration, let us consider (1.3). In Nakanishi (2004, 2007, 2008), the presence of a prosodic boundary is briefly discussed as influencing the interpretation of an FNQ sentence. According to Nakanishi, in (1.3) the sentence seems to be ambiguous because it offers both distributive and collective (non-distributive in our terms) readings without a boundary; however, it only allows for a distributive reading with a boundary. A prosodic boundary that accompanies a long pause is indicated by "//."

(1.3)

Gakusei ga (//) *go-nin* tsukue o mochiageta.

student Nom five-Cl desk Acc lifted

(i) 'Five (of the) students lifted a desk (individually).' **[Distributive]**

(ii) 'Five students lifted a desk (together)' **[Non-distributive]**

(Nakanishi 2007, 2008)

When determining sentence meaning, to avoid the potential ambiguity and ensuing complications that reside in the FNQ sentence, Nakanishi focuses on a case wherein a certain element (e.g., *kinoo* "yesterday") intervenes between an FNQ and its host noun to make the FNQ sentence produce a distributive meaning, as in (ii). However, as Nakanishi admits, we must inevitably question the implications of the data presented in (1.3) with regard to the theory of FNQ constructions in Japanese. The current study instead shows that the role of prosody and information structure cannot be ignored in syntactic research. Indeed, as will become evident below, prosody must be given a major role in FNQ construction.

One assumption that has not been called into question is that an FNQ is a distributive operator (Gunji and Hasida 1988; Kobuchi 2003, 2007; Nakanishi 2004, 2007, 2008). In terms of semantics, for many researchers the denotation of an FNQ is never interpreted as an established set. They claim that due to the lack of status as an established set, the FNQ cannot have a collective (or non-distributive) reading and each instantiated entity must be individually involved in the event or action to produce a necessarily distributive reading as in (1.3 (i)). We discuss this in detail in Chapter 4.

However, the issue with FNQ semantics has not yet been sufficiently explained. It is noteworthy that appropriate prosody (in the right context) can even make the non-distributive (or collective) FNQ interpretation the most natural one, as seen in (1.3 (ii)). Evidently, the difficult issue here is identifying a non-distributive reading, but there is indeed a natural reading of

non-distributive FNQs, as shown in example (1.4) below. Sentence ((1.4) a) does not allow for a distributive reading without a boundary, as shown in ((1.4) b). However, this reading becomes acceptable with a pause that is immediately inserted after the FNQ, as in ((1.4) b) (see also Miyagawa and Arikawa 2007: 661-2).

(1.4)

a. ??**Gakusei ga** kinoo *san-nin* Peter o koroshita.
student Nom yesterday three-Cl Peter Acc killed
'Three students (as a group) killed Peter yesterday.' (Nakanishi 2007:53)

b. **Gakusei ga** kinoo *san-nin* // Peter o koroshita.
student Nom yesterday three-Cl Peter Acc killed
'Three students (as a group) killed Peter yesterday.'

The example above demonstrates that even though a sentence is deemed ungrammatical, it may still be used in certain circumstances.[11] Note that, as indicated in the translation in ((1.4) b), the contribution of the FNQ meaning is not distributive. In other words, the verb *korosu* 'kill' used in (1.4) ensures that the sentence is not distributive in terms of individuals or events (see section 3.1 for the definition of distributivity).[12]

Examples (1.3) and (1.4) strongly indicate that we may not be able to think of FNQs as distributive operators.[13] If this is the case, then the previous analyses that treated FNQs as distributive would need an additional mechanism to account for the presence of non-distributive readings. Contrary to existing

[11] Pinker (2007: 33) states that designating a sentence as "ungrammatical" simply means that native speakers tend to avoid the sentence, cringe when they hear it, and judge it as sounding odd. See also a similar example (2.5) in Chapter 2.

[12] The difference between verbs such as *kill* and *make* is interpreted as the distinction of whether an individual's direct contribution to or involvement in the action, denoted by the predicate, is perceived (see Chapter 4 for further discussion).

[13] For instance, Kobuchi (2003) and Nakanishi (2004) insist that this non-distributive reading can still be explained according to their theory by modifying the cover reading. Whether this is the correct direction to pursue depends on what the notion of distributivity is and whether the FNQ is indeed a distributive operator in the sentence (see section 3.1 (Chapter 3) for discussion of distributive readings employed in this study).

studies, the present essay argues that FNQ interpretation follows the assumption that prosody and interpretation are distinctly assigned to FNQ sentences (even in silent reading) either as NP-related FNQs (the subject NP and its associate FNQ form a single intonational phrasing) or as VP-related FNQs (the subject NP and its associate FNQ form separate phrasings); see Chapter 5 for the description of distinctive intonational patterns.

The issue of interpretation illustrated above indicates that a reconsideration of past data on distributive or non-distributive readings is advisable. The fundamental question to be answered is why FNQ sentences are ambiguous, offering both distributive reading and non-distributive readings.[14] In an attempt to answer this question, we present evidence in support of the claim that FNQs are ambiguous between NP-related FNQs (object (or individual) quantifiers) and VP-related FNQs (event quantifiers), and preference is a matter of degree (see Chapter 5 for discussion).[15]

In addition to distributive and non-distributive interpretations, FNQ sentences exhibit another type of semantic ambiguity: partitive or non-partitive, as the English translations of ((1.1) b, c) imply, with different degrees of preference for various interpretation. Whether the FNQ sentence is ambiguous with regard to these two readings (in conjunction with distributive and non-distributive readings) or simply vague is open to debate (Fujita 1994; Ishii 1998; Kobuchi 2003; Nakanishi 2004, 2007; Kuroda 2008). We address this significant issue in Chapters 4 and 5.

A conclusive theory must also explain that sentences (1.3) and (1.4) become more natural and easily understood as non-distributive if a long pause

[14] In semantic terms, when the denotation as a set (group) is highlighted, the FNQ presumably has a non-distributive reading. By contrast, when the individuality in the denotation as a set of individuals is highlighted, the FNQ has a distributive reading (see Chapter 4 for more discussion on this matter).

[15] For expository reasons, we simply take the traditional (and more familiar) view that the verb phrase (VP) consists of a verb, direct and indirect objects, and verbal modifiers. It does not include external arguments (the NP in this situation). This view contrasts with many versions of the Minimalist Program (Chmsky 1995), wherein the VP is split into two parts: a lower part, which corresponds to the traditional view of VPs, and a higher part (a light *v*P), which includes the external argument (see Carnie 2008 for a detailed discussion on phrasal categories in modern linguistic theory).

is inserted immediately after the FNQ.[16] This means that there must be more than just syntax and semantics informing FNQ construal: the FNQs in ((1.1) b, c) yield different readings (with different types of contextual information) in the discourse in which the quantifier is used.[17] In the following chapters, we provide arguments in support of the assumption that an FNQ sentence has different interpretations because its sentence structure is ambiguous in nature (between NP-related and VP-related readings), and people use syntactic and discourse contextual information (along with intonation) about the subject NP and the following FNQ phrase to choose between possible "attachment" locations (i.e., nominal or verbal) when processing the sentence.

Regardless of approach, the analysis must explain the variances in FNQ interpretations presented so far. To the best of our knowledge, no established study has straightforwardly explained the apparent interpretation difficulties observed in (1.3) and (1.4) or attempted to examine in detail the aspects of FNQ prosody.[18] This is no doubt problematic. Thus, to understand the nature of FNQ constructions, we must inevitably consider prosody and information structure and structure and meaning.

Note that we assume the grammaticality (or acceptability) of (1.3) and (1.4) to involve prosody (see also section 2.2). We expect similar sentences to improve with appropriate prosody control and relevant information structures. The findings of the perception test in section 5.4 (Chapter 5) suggest the significance of the relationship between prosody and syntactic disambiguation, particularly regarding the listener's sensitivity to the presence or absence of prosodic boundaries at key points and variance in pitch range (see Clark and

[16] Gricean considerations also may lead us to claim that certain reasons cause a speaker to use a more complex NP than necessary. The grammaticality of examples (1.3) and (1.4) seems to be more associated with discourse-pragmatic factors (e.g., focus or non-focus) than syntactic factors.

[17] Sections 3.1.2 (Chapter 3) and 4.2.8 (Chapter 4) provide a detailed examination of the interpretive differences between distributivity and non-distributivity by considering further examples.

[18] One exception is Miyagawa and Arikawa (2007), which reports that prosody may play an important role in processing FNQ construction, although the main focus of the research is subject-object asymmetry (i.e., subject-oriented vs. object-oriented FNQs) in structural terms.

Wasow 1998, and Férry and Ishihara 2009 for related discussion).[19] In written language, structural information is often entirely missing, except when indicated by an occasional comma (Bolinger 1968; Fodor 1995, 2002; Kitagawa and Fodor 2006). The silent reading of (1.3) would permit a different range of quantifier scope interpretations than that obtained from pronounced examples; however, that range can still be controlled by prosody in a subtle way (see section 3.1.4 (Chapter 3) for a discussion of scope interpretation in FNQ constructions).

The present study addresses the meaning and function of FNQs, which have been overlooked by existing research. Most importantly, a closer examination of prosody has enabled us to better understand the interpretive aspects of FNQs. This study differs from previous studies in that by conducting an experiment, it shows how some FNQs are adnominal (serving as object-related quantifiers), while others are adverbial (functioning as event-related quantifiers). More specifically, an FNQ is not necessarily an adverb to the verb phrase. That is, it is not always syntactically expected that the FNQ phrase will occur in the verbal domain, but rather as a special sort of determiner to the noun phrase, which is construed with the noun in the nominal domain, not the verbal domain (see Chapters 4 and 5 for more discussion). This is contrary to what has been shown in studies such as Dowty and Brodie (1984), Fukushima (1991), Gunji and Hasida (1988), Kobuchi (2003, 2007), Nakanishi (2004, 2007, 2008). This systematic difference can be naturally integrated into a Combinatory Categorial Grammar (hereafter CCG) analysis of FNQs as will be proposed in Chapter 6.

[19] This study does not examine how speakers produce various FNQ sentences. As Shafer et al. (2000) point out, the difficulty with a production study is the difficulty in creating an ideal situation. This ideal situation means that the utterances produced are spontaneous and typical of everyday conversation, and at the same time carefully controlled for the sentence types used, such that various renditions of the otherwise same syntactic structures can be contrasted. Typically, many previous production studies have elicited utterances from read speech, which is often produced by professional speakers such as trained phoneticians or professional radio announcers (for further discussion, see Price et al. 1991 and Cowart 1997).

1.2 Objective

To provide a viable approach to Japanese FNQ sentences and address the interpretive variances outlined in section 1.1, we offer distributional and interpretive arguments for different types of FNQs (NP-related and VP-related FNQs). We suggest that both context and prosody, in addition to syntax and semantics, contribute to the disambiguation of an FNQ (whether NP related or VP related) and overall acceptability of the sentence.

Our primary objective is to provide an empirical and theoretical explanation of the existence of more than one possible FNQ interpretation (NP-related and VP-related readings). We assume that a language like Japanese makes a syntactic and semantic distinction between these quantifiers in relation to a particular context, and focus on the behavior of NP-related FNQ sentences wherein an object-quantifier (rather than an event-quantifier) interpretation is obtainable and presumably chosen in accordance with the information structure encoded within the discourse.[20]

Our second objective is to examine in detail how informational and prosodic factors are related to the interpretation of FNQ sentences. We expect to find these factors embodied by prosodic boundaries, the relative pitch ranges of prosodic boundaries, the choices of prosodic patterns, among others. To investigate the role of information structure and prosody with regard to FNQ placement and associated interpretation, as seen in (1.3) and (1.4), we conducted an experiment on FNQ sentence comprehension (see Chapter 5).

As a basic tenet of pursuing these objectives, it is worth mentioning Pinker's (2007) informal statement on the speakers' judgment. Pinker (2007: 33–4) states that calling a sentence ungrammatical means that it sounds odd all other things being equal. That is, in a neutral context, the sentence is used with its conventional meaning and with no special circumstances in play. In light of

[20] We may say that VP-related FNQs are common rhetorical patterns and NP-related FNQs are newly identified rhetorical patterns, both of which express the informative intention of the speaker in a given context.

this, we argue that the study of FNQ constructions brings into focus that humans are able to change the way they perceive quantification, depending on the viewpoint taken in the context (For similar views, see Bolinger 1968; Fodor and Sag 1982; Fodor 1995, 2002; Larson 2006; Abbott 2010).

Since Japanese FNQ constructions constitute a major source of complexity for current theories of natural language grammar, it is uncertain whether the cooperation between syntax and prosody can identify a unified notion of syntactic constituent structure that is different from the traditional one. In the theoretical part of this study, we formalize in CCG the interaction of syntactic and phonological constraints on information structure.[21] As argued in Chapter 6, this interaction seems best described using the notion of flexible constituency, as utilized in CCG (Steedman 1996, 2000a, b, 2012, and Steedman and Baldridge 2011). The theory allows for the division of a clause into components of various types, including standard (X'-theoretic) constituents and sequences of words that are not components according to either a principles-and-parameters-based or LFG-based view (for relevant discussion, see Carnie 2008: Chapters 9-10).

1.3 Organization

The dissertation is organized as follows: Chapter 1 briefly introduces Japanese FNQ constructions and presents the objectives of the study. Chapter 2 reviews the pertinent literature and introduces basic assumptions necessary for the alternative analysis of FNQ sentences to be developed. Chapter 3 discusses major interpretive issues (i.e., ambiguity and intonation) and related unsolved problems. In describing the basics of FNQ interpretation to facilitate subsequent explanations, it is suggested that FNQs cannot be described by looking at syntactic structure alone; rather, it is necessary to examine the

[21] Here, we use the term *constraint* in a fairly neutral sense and refer to a rule of grammar that can be either satisfied or violated in a given structure (see Hendriks 2003, and Hendriks and de Hoop 2001).

process of structure building and the interaction between prosody and information structure. In Chapters 4 and 5 this hypothesis is shown to be plausible. Chapter 4 focuses on the syntax and semantics of FNQ interpretation. Based on various interpretive facts, FNQs are classified into two types (i.e., NP-related and VP-related) and it is posited that FNQs are potentially ambiguous in the sense that semantics generates possible readings and preference is then determined by discourse pragmatics (e.g., information structure and prosody). Chapter 5 focuses on the relationship between information structure and prosody, which is closely related to the interpretation of FNQ sentences. It is argued that information structure influences the position of an FNQ and its interpretation by way of prosody. The results of a perception test are adduced to corroborate this assumption. Chapter 6 presents a formal analysis within CCG (Combinatory Categorial Grammar) that can straightforwardly handle FNQ interpretation. This theory permits the proper description of the syntactic, semantic, and pragmatic (e.g., informational and prosodic) aspects of Japanese FNQ constructions. Chapter 7 summarizes the earlier discussion and offers concluding remarks.

CHAPTER 2

Previous Studies and Background

This chapter reviews the relevant literature and sets out the basic assumptions necessary for the alternative analysis of Japanese FNQ sentences to be presented in later chapters. Japanese FNQs have been subjected to in-depth syntactic analysis to determine how FNQs come to occupy their positions within particular sentences. There is, however, some disagreement in the literature about the precise analysis of FNQ positioning in sentences. The present study agrees in many cases with the existing proposal that FNQs are adverbial. However, the study will suggest that FNQs are in some cases adnominal. It is proposed that there are two types of FNQs in Japanese: NP-related and VP-related. This is consistent with the fact that one of the most important factors affecting prosodic phrasings is the focusing of certain words (cf. Yamamori 2006). This makes it possible to consider FNQ constructions focus-sensitive in the sense that the focus can be on either the NP or the VP, depending on where the emphatic stress (or pitch accent) is located.

2.1 Three approaches

There have been three major approaches to describe the non-local dependency and signification relationship between the subject noun and its associated NQ in FNQ sentences. This study does not evaluate all theories of FNQs in detail (see Gunji and Hasida 1988; Yamamori 1999; Nakanishi 2004, 2008 for thorough overviews). Instead, we first review three major approaches to FNQ constructions on the basis of observations made by Ko (2007, 2010) and Nakanishi (2007, 2008). We then argue for a hybrid analysis that admits both adnominal and adverbial FNQs. On this analysis, we assume that FNQ sentences are potentially ambiguous, offering both a VP-related and an

NP-related FNQ reading when such a reading is possible.[22]

First, we address the adnominal approach, in which the FNQs observe syntactic locality with their associated NP by transformational movement (see Haig 1980; Kuroda 1980; Miyagawa 1989; Fukushima 1991; Miyagawa and Arikawa 2007; among others). This approach has some advantages in explaining the close relationship between FNQ and non-FNQ constructions (see Fitzpatrick 2006 for a summary and examples to support this approach). For instance, the semantic similarities between ((1.1) a) and ((1.1) b) in Chapter 1 straightforwardly follow from the claim that they share a similar base structure (see Inoue 1978; Kamio 1977 for relevant discussion). A set of data comes from the widely known word order restriction on FNQs: the subject and its FNQ need to be adjacent, as shown in ((2.1) a, b) (see Haig 1980; Kuroda 1980).

(2.1)

a. ***Gakusei ga** hon o *san-nin* kat-ta.
student Nom book Acc 3-Cl buy-Past
'Three students bought a book/books.'

b. **Gakusei ga** *san-nin* hon o kat-ta.
student Nom 3-Cl book Acc buy-Past

One of the most convincing attempts is found in Miyagawa's (1989) stranding analysis. His theory requires that the subject and its FNQ be in a mutual c-command relation and successful in accounting for various distributional restrictions on FNQs, including (2.1). However, this account has been challenged by alternative theories—notably, the adverbial view described

[22] In the present study, we do not take a particular position on how FNQ constructions are best derived syntactically. Rather, our main interest lies in their functional properties. Note that we do not consider syntactic structure as irrelevant, rather it is indirectly relevant because syntactic information is referred to in the construction of various prosodic constituents above the word level, which is discussed later (see Selkirk 1986, 1995; Selkirk and Tateishi 1991; Shiobara 2004, among others).

below.

It is likely that some FNQs are adnominally used; however, we take a different position than that of the above mentioned studies in arguing that the adnominal approach to Japanese FNQs is motivated by semantic considerations of FNQs, rather than syntactic ones (see Kitagawa and Kuroda 1992, and Ishii 1999 for a similar claim). As previously mentioned, what plays a crucial role is a distinction between distributive and non-distributive interpretations. Based on the assumption that an FNQ interpretation in principle derives from its surface structure, adnominal FNQs quantify over the host NP in the nominal domain. For the most part, this reading is non-distributive and non-partitive (see, (1.3 (ii)) and ((1.4) b) above).[23] Another hypothesis to be made in this study is that the availability of a non-partitive reading indicates that the FNQ serves to emphasize the exhaustivity (or totality) present in the subject NP. On the other hand, adverbial FNQs quantify over events denoted by verbal predicates. In Chapter 4, we discuss in detail the description of semantic distinctiveness represented by the two types of FNQs.

Second, we take the adverbial approach (Kuno 1978; Gunji and Hasida 1998; Takami 1998; Kobuchi 2003, 2007; Nakanishi 2004, 2007, 2008, 2009). In the literature, the adverbial approach has been a topic of controversy and opposed by the transformational approach, which continues to be influential (Fitzpatrick 2006; Watanabe 2006, 2008; Miyagawa and Arikawa 2007). In this approach, FNQs are free from such locality, which is similar to the adnominal approach. The adverbial approach possesses some merits as well. When an FNQ appears in a non-argument position, the adverbial approach best explains

[23] Note that, as Nakanishi (2008: 302) mentions, semantic properties of FNQs do not *per se* rule out the stranding view. Indeed, we can expect to find some semantic differences as a result of movements involved in the stranding view. For instance, Watanabe (2006, 2008) discusses another semantic difference between FNQ and numerals (NQ *no* NP; e.g., *san-nin no gakusei*) in a nominal projection—namely, partitivity (the FNQ, not the numerals in a nominal projection, evokes a partitive interpretation: see Inoue 1978; Fujita 1994; Hamano 1997)—and argues that this semantic difference can be captured under the stranding view in his theory. Next, the task for the stranding view is to explain why FNQs have semantic properties that differ from numerals that apparently quantify over nominal predicates. This is also problematic for many studies that assume all FNQs are adverbial. We hypothesize that the two types of Japanese FNQs are informationally motivated and distinguished.

FNQ distribution. Some semantic differences between FNQ and non-FNQ constructions are also naturally explained by the adverbial approach. The core data, which constitute counterexamples to the stranding view by the adnominal approach, are presented in (2.2). The stranding view would predict these examples to be ungrammatical because the FNQ does not c-command the host NP.

(2.2)

a. **Kodomo ga** butai-de *juu-nin* odot-ta.
child Nom stage at 10-Cl dance-Past
'Ten children danced on the stage.' (Takami 2001:129)

b. **Gakusei ga** toshokan de *go-nin* benkyooshi-tei-ta.
student Nom library at five-Cl study-Prog-Past
'Five students were studying at the library.' (Mihara 1998:89)

c. **Gakusei ga** naihu de koremadeni *huta-ri* te o kegashi-ta.
student Nom knife with so-far 2-Cl hand Acc injure-Past
'So far two students injured their hands with the knife.'
(Fukushima 1991:52)

These examples challenge the validity of the stranding view (see Fitzpatrick 2006 and Miyagawa and Arikawa 2007 for an attempt to redefine the locality condition to permit FNQ examples such as these).

Third, we present the hybrid approach, which contends that both adnominal and adverbial approaches are partially correct (see Ishii 1998, 1999; Fitzpatrick 2006; Ko 2007; Ko and Oh 2010). It is argued that in languages such as Japanese, some FNQs are considered adnominal, while others are adverbial. Furthermore, the two types of FNQs display different semantic and syntactic properties. For instance, Ishii (1999) argues that FNQs are ambiguous between a stranded FNQ and an adverbial FNQ, and counterexamples to the adnominal FNQ approaches are limited to cases wherein the FNQ permits a

distributive reading, and thus should be analyzed as an adverbial FNQ, according to the adverbial approach.[24]

The predictions of these three approaches to FNQs differ. In the adnominal approach, we predict that the distribution of FNQs is restricted by the locality conditions on NP-movement (for further details, see Fitzpatrick 2006). By contrast, in the hybrid approach, only a subset of FNQs exhibits such locality effects.[25] In the adverbial approach, FNQs appear rather freely, provided event quantification is possible.[26]

Many researchers supporting the adverbial approach assume that only a distributive reading is possible for FNQ constructions. In particular, as illustrated in ((2.3) b), they believe that FNQs are incompatible with verbal predicates denoting an event that can occur only once, although numerals in a nominal projection do not have such a restriction, as in ((2.3) c). Nakanishi (2004, 2007, 2008) claims that this can be explained if FNQs are tied with quantification over events denoted by a verbal predicate. (In (2.3) judgments on acceptability are Nakanishi's.)

(2.3)

a. **Gakusei ga** kinoo *san-nin* Peter o tatai-ta.
student Nom yesterday 3-Cl Peter Acc hit-Past
'Three students hit Peter yesterday.'

[24] Fitzpatrick (2006) argues that the split between the two types of FNQs exists not only between languages (e.g., Japanese vs. English) but also within a single language (e.g., Korean, West Ulster English). He also shows that "exhaustivity" is systematically related to FNQ types of exhaustivity. Ko (2007) and Ko and Oh (2010) focus more on the syntactic properties of FNQs and claims that whereas the distribution of adnominal FNQs is affected by various syntactic factors (e.g., grammatical function of the host noun, argument structure of the verb, and the position of the intervening element), the distribution of adverbial FNQs is not restricted by those syntactic factors alone (see also Nakanishi 2007, 2008 for a similar view). This study agrees with Ko's view; however, as discussed later, both adnominal and adverbial (subject-oriented) FNQs are frequently affected by non-syntactic factors.

[25] We do not agree with this view because the distinction of FNQ usage is largely based on context and intonation rather than syntactic locality (e.g., mutual c-command relation) (see Chapter 3 for more discussion).

[26] This statement is not entirely problem-free. FNQs are not true adverbs, so they do not always pattern like them (see Bošković 2004 for critique of the adverbial approach).

b. ??**Gakusei ga** kinoo *san-nin* Peter o koroshi-ta.
student Nom yesterday 3-Cl Peter Acc kill-Past
(Nakanishi 2004: 67)

c. San-nin no gakusei ga kinoo Peter o tatai-ta/koroshi-ta.
3-Cl Gen student Nom yesterday Peter Acc hit-Past/kill-Past
(Nakanishi 2008: 301)

One potential problem with the adverbial view is that FNQs do not necessarily quantify over verbal predicates, as we see in (2.4) (see Bošković 2004). In these sentences, the verb *koroshita* 'killed' and the adverb *isshoni* 'together' ensure that the event described in the sentence is a single event, rather than multiple events.

(2.4)

a. **Gakusei ga** kinoo *san-nin* // Peter o koroshita. (=(1.4))
student Nom yesterday three-Cl Peter Acc killed
'Three students (as a group) killed Peter yesterday.'
(cf. Nakanishi 2007: 53)

b. **Otokonoko ga** kinoo *san-nin* isshoni booto o tsukut-ta.
boy Nom yesterday three-Cl together boat Acc make-Past
'Three boys made a toy boat together yesterday.'
(cf. Nakanishi 2007: 58)

The data in (2.4) as compared with ((2.3) b) would lead us to advocate for yet another view: a hybrid approach that is informationally and intonationally defined (see Chapter 4 for discussion). Let us remark that, as discussed earlier, this position totally differs from that in Ishii (1998, 1999), imposing syntactic locality on FNQs associated with NP (requiring the FNQ and its host NP be adjacent).

Although the predictions of the three approaches to Japanese FNQs can

be clearly stated, there has been a lack of consensus on which prediction is empirically supported by data. Each approach often uses different sets of data and researchers occasionally report different judgments on the same data set (for debates on Japanese FNQ data, see Hoji and Ishii 2005; Miyagawa and Arikawa (2007)). It has been unclear what is meant by "unacceptability." This is no doubt problematic, since, as Sorace and Keller (2004: 1) stated, acceptability judgments are the basic data that linguists rely on to formulate their theories. It remains unclear whether unacceptability of FNQ constructions comes from mere processing difficulty or quintessential ungrammaticality (see section 2.2 below). If the former is correct, we expect that unacceptability can be overcome in a judgment task. In accordance, Miyagawa and Arikawa (2007) claimed that prosody plays a role in processing FNQ constructions, although they only conducted a pilot study. Their main focus was on the so-called subject–object asymmetry, a much discussed topic in literature (see Miyagawa 1989; Gunji and Hasida 1998; Shimojo 2004, among others).

The present study broadly agrees with the existing proposal that FNQs are adverbial. However, we claim that FNQs are not only adverbial but also adnominal. This can be ascertained in the light of the fact that one of the most important factors affecting prosodic phrasings is the focusing of certain words. FNQs are considered focus sensitive in that the focus is either on the NP or the VP, depending on where the emphatic stress (or pitch accent) is located, as illustrated in (2.5) below (the uppercased words are those emphatically stressed).[27] In sentence ((2.5) a), the FNQ is focused upon, while in ((2.5) b) the subject is emphasized, and both expressions presumably contribute to increasing acceptability.

[27] This study assumes that a number of factors that deal with relative importance (for instance, the importance a speaker attaches to a given constituent in a given context and with more arbitrary or structural considerations), jointly determine the intonational patterns, which correlate with certain discourse and semantic effects. Focus is a theoretical notion to be used to account for the correlation (Jackendoff 1972, 1997, 2007; Gundel 1999; Gundel and Fretheim 2004; Kadmon 2001).

(2.5) (cf. (1.4), (2.4a))

a. ??**Gakusei ga** kinoo // *SAN-NIN* Peter o koroshita.
student Nom yesterday three-Cl Peter Acc killed
'Three students (each) killed Peter yesterday.'

b. **GAKUSEI GA** kinoo *san-nin* // Peter o koroshita.
student Nom yesterday three-Cl Peter Acc killed
'Three students (as a group) killed Peter yesterday.'

In fact, there are cases wherein FNQ sentences can have non-distributive readings; however, only with a particular prosody. Although the frequency of such FNQs may vary according to context, as further discussed in Chapter 5, this tells us that prosody disambiguates syntactic structure. Given that prosody correlates with interpretation, the FNQ construction, in information structure terms, can be regarded as a sort of focus construction in the sense that it generates a focus-affected reading in discourse (see (2.5)). This means that the FNQ itself does not always encode new information (contrary to Takami 1998, 2001; Hatori 2002), which is an important claim both empirically and theoretically in this study.[28]

Note that the adverbial approach needs to somehow account for the contrast in acceptability between (2.5) a and b. This also raises an interesting question as to whether the FNQ in ((1.1) b, c) in Chapter 1 really quantifies over the host NP just as the numerals "NQ *no* NP" in ((1.1) a) do. The answer is affirmative for the FNQ-as-adnominal view (see Kobuchi 2003, 2007), in which the FNQ, being in the same nominal projection as its host NP, should quantify over the host NP just as the numerals in ((1.1) a) do (see footnote 4).

Examples such as (2.2) and (2.3) indicate that the FNQ has something to do with quantification over a verbal predicate. The challenge for the adnominal view is to provide a mechanism of the FNQ having an effect on a verbal

[28] In the present account, we assume that this type of FNQ is usually realized in the VP-related FNQ sentence (see section 4.1 (Chapter 4)).

predicate. In contrast, in the adverbial view, the FNQ syntactically combines with, and correspondingly quantifies over, a verbal predicate. Then, the challenge is accounting for the fact that the connection between the FNQ and its host NP cannot be ignored.

Given these considerations, a hybrid approach to FNQs motivated by interpretation seems promising to explain these phenomena. My assertion is that the mixed acceptability observed in ((2.3) a, b) and ((2.5) a, b) should be attributed to the existence of two distinct types of FNQs (i.e., NP-related and VP-related FNQs). In this sense, the FNQ is ambiguous between these two uses. The current study then evaluates the predictions and validity of this hybrid approach as motivated by the two types of interpretations present in FNQ sentences, and provides a new outlook on old issues and problems regarding FNQ placement and interpretation.

2.2 Grammatical judgment of FNQ sentences

As briefly discussed in section 1.1 (Chapter 1), most prior analyses of Japanese FNQs have been problematic because the data is given in isolation without context (see, e.g., Bolinger 1968 for a criticism of such linguistic research). In this study, FNQ sentences, commonly analyzed in terms of syntax, are re-examined in the light of growing awareness of the role played by prosody in language (see Bolinger 1968; Fodor 1995, 2002; Deguchi and Kitagawa 2002; Kitagawa and Fodor 2006, among others).[29] Syntactic structure, as Kitagawa and Fodor (2006: 340) argue, certainly influences prosodic structure, and speakers and listeners often use prosodic differences to disambiguate utterances of different syntactic structures. Taking into account that it is rare to encounter sentences without any context, we examine how prosodic information interacts with a salient context in determining FNQ

[29] Deguchi and Kitagawa (2002) offer arguments to show that the relationship between the typology of *wh*-questions and sentential stress has interesting implications for determining the type of a language with respect to *wh*-questions.

placement and interpretation.

We make an important departure from previous studies in assuming that the grammaticality of a linguistic expression (here FNQs) cannot be determined for that expression in isolation.[30] This in turn means that information structure (with particular intonation) has much to do with the felicity (and acceptability) of an FNQ sentence.[31,32]

This approach leads to the assumption that interpreting FNQs highlights the importance of the relationship between syntax and phonology. We need carefully controlled data on FNQ constructions to re-examine the judgments found in previous studies and better address the issue of grammatical judgment variations.

2.3 Architecture of CCG

A significant argument of this study is that the interpretation of FNQ sentences should be accounted for in terms of syntax, semantics, and pragmatics (e.g., information structure and prosody). In Chapter 6, we propose a formal account exploiting CCG, which serves as a useful framework for the analysis of the two types of FNQ constructions. CCG syntax subsumes prosodic structure: it is possible to subsume both intonation and information structures under a single notion of information structure (see Steedman 2000a, b, and Steedman and Baldridge 2011 for discussion).

Regarding CCG theory, it is conceptually and technically easier to incorporate into the theory a syntactic pragmatic description of grammatical

[30] Contextual effects relevant to FNQs in Japanese have largely been left untouched, except for Downing's (1984, 1993) pragmatic studies, which substantiated Martin's (1975) earlier work (see also Takami 1998, 2001 for a functional analysis of Japanese FNQ sentences), although Downing does not address the specific issues discussed on this study.

[31] An utterance's focus can be identified by asking "To what question(s) is the utterance with the specified accent pattern felicitous?" (cf. Halliday 1967 and Kahnemuyipour 2009) See Chapter 5 for further discussion.

[32] Here, we adopt the widely accepted view that information structure is an aspect of syntactic representation, which interfaces with the phonological form by rules of information structure realization.

phenomena (including FNQ constructions in Japanese), largely determined by the context of use. The CCG account clarifies how the process works and how its interpretation relies on prosodic events such as pitch accents or boundary tones to delineate its information status; for instance, 'theme' and 'rheme' components (see Steedman 2000a, b for details). The CCG approach successfully account for the relationship between prosody and information structure. Here, we first provide an outline of this section's analysis.

The grammar to be assumed in CCG contains semantic information and pragmatic information.[33] However, in CCG the traditional distinction between semantics (what is in the grammar) and pragmatics (what is outside of the grammar) is no longer necessary. This view is compatible with our present analysis of FNQ constructions.[34] Steedman (2000a, b) goes as far as to propose a separate level of representation for information structure, schematized in Figure 2.1 below.[35] This presents a more liberal notion of syntactic structure, one that is directly compatible with the boundaries observed by phonologists (Steedman 2000b: 126). Prosody provides important indications regarding information structure. In Figure 2.1, the lexicon statically assigns a triple consisting of a phonological form Φ, a syntactic type Σ, and a logical form Λ to all lexical items, and is the sole locus of language-specific information in the grammar. (In the figure, the tone symbol, which is associated with the accented syllable, is represented as a superscript "*" to the right of H. The subscript θ and ρ are the two information values *theme* and *rheme*, respectively.[36])

[33] In addition, there are factors outside of the grammar that affect sentence meaning, probably factors affecting both semantics and pragmatics (see Kadmon 2001 for a detailed discussion of numerous phenomena at the semantics-pragmatics interface).

[34] The view may also be in accordance with that adopted in the model of Dynamic Syntax (Kempson et al. 2001), although this study does not compare and evaluate the two grammar models.

[35] A more refined architecture of CCG is provided in Figure 6.1 (Chapter 6).

[36] The term *theme* and *rheme* originate with Halliday (1967); we have somewhat generalized his usage here. The much abused term *focus* is used in CCG strictly in the phonological sense of the term to refer to the effects of contrast or emphasis on a word that ensues from the presence of a pitch accent (see, e.g., Steedman 2000a, b, 2012; Steedman and Baldridge 2011).

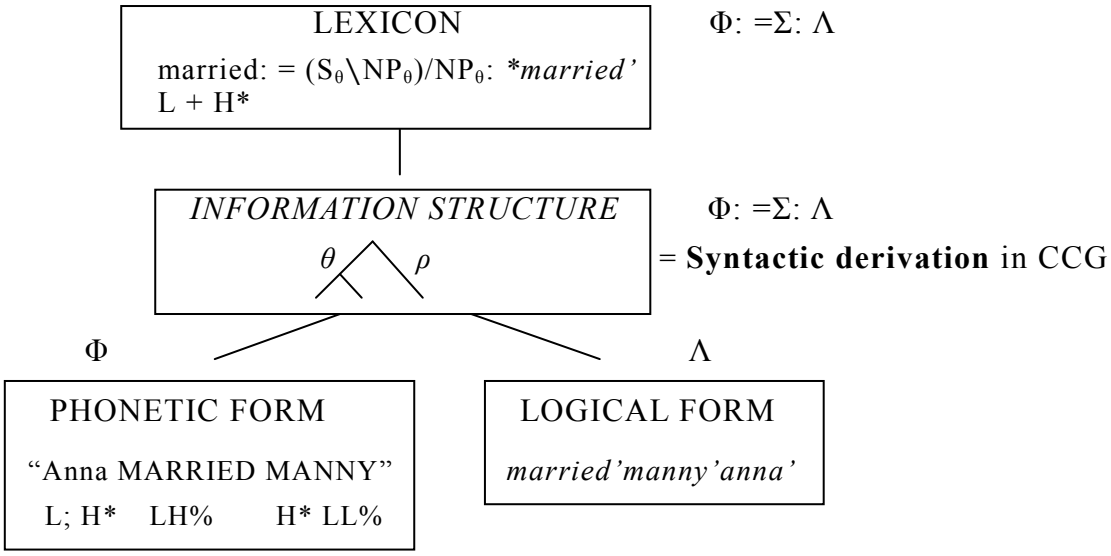


Figure 2.1. Architecture of CCG (Steedman 2000b: 126)

The combinatory rules and process of lexical insertion monotonically map between PF and LF, also assigning a triple Φ: Σ: Λ: to all elements in the derivation. Note that there is no fixed order in which particular kinds of information are considered in the model. For example, it is not the case that syntactic information (e.g., agreement or case-marking information that might rule out a particular parsing) is always consulted before semantic information (e.g., semantic incompatibility that would favor or disfavor a potential interpretation of an utterance) (see Steedman 1996, 2000a, b, 2012; Steedman and Baldridge 2011).

Crucially, syntax derives from information structure (Figure 2.1). In the figure, the level of Phonetic Form (PF) is a true interface level, representing only the information necessary to specify speech or orthography. The level of Logical Form (LF) is the sole structural level of representation and identified with information structure, a level which contains all the information that is needed for processes of verification and inference in the context of discourse.

Since in CCG meaning is derived from aspects of phonology (or phonological structure), words and clauses, larger textual structures, and aspects of semantic component are considered because they relate to "all"

levels. However, since meaning is strongly associated with lexical items and syntactic structures, a section on word semantics follows the morphological section and a section on sentence semantics follows the syntactic section.

In Chapter 6, considering the architecture and representation of a sentence's information structure (in relation to a particular intonation contour) are interpreted as an interface between the syntactic and pragmatic module, we develop and argue for a syntactic analysis of FNQ constructions. This allows us to precisely and succinctly describe both information structure and prosody.

2.4 Summary

Our discussion so far can be summarized as follows: although the adnominal approach is successful in many cases, it cannot adequately account for several problems. Considering that FNQ patterns behave like adverbs, the adverbial approach deals with FNQ placement more successfully than the adnominal approach; nonetheless, it leaves several questions unanswered.

One of the strongest arguments against the adverbial approach is that some FNQs behave like NP-internal modifiers in that they produce an object-related quantifier reading, rather than an event-related quantifier reading (e.g., (2.4) and (2.5)). This leads to the consideration that there are some cases wherein FNQs cannot be classified as modifying only the VP or the NP, since they have a relationship with both the NP and VP (Nakanishi 2008: 302). Both the subject and the predicate obviously engender restrictions on the FNQ in some way.

Compared with other models, the hybrid approach is superior because it can account for the specific position FNQs occupy and their resulting interpretation. This issue is discussed in further detail in Chapters 4 and 5.

CHAPTER 3

The Issues

This chapter discusses the major interpretive issues of concern in this study (i.e., ambiguity and intonation) and related unsolved problems. These issues have sometimes been addressed in previous studies, but have rarely been exmined in detail. To clarify the main differences between VP-related and NP-related FNQs, the present study re-examines FNQs that have been widely analyzed as adverbs, in terms of context and intonation. It is shown that existing research errs in assuming that FNQs can only generate distributive readings, and that this error arises due to the incorrect treatment of non-syntactic aspects of these constructions. Accordingly, the present study claims that it is necessary to examine the process of structure building and the interaction between prosody and information structure.

3.1 Ambiguity

In general, different readings involve different truth conditions in accordance with information structure (Jackendoff 1972, 2007; Kadmon 2001; Dalrymple and Nikolaeva 2010). FNQ interpretation is the result of distinctive levels of interrelated phenomena, both syntactic and discourse pragmatic. To illuminate factors affecting FNQ interpretation, we limit arguments to the ambiguity between distributive and non-distributive and between partitive and non-partitive readings.[37]

[37] For other issues supposedly involving individual or stage-level predicates, see Horn (2008) and references therein.

3.1.1 Distributivity and non-distributivity

We first determine influencing factors and how these factors are involved in establishing an appropriate link among the host NP, the FNQ, and the verbal predicate in an FNQ sentence. Here, we provide an overview of these basic ideas, which is further elaborated in Chapters 4 and 5.

As mentioned in Chapter 1, observations made in this study are confined to FNQs that are separated from (but consequently associated with) their subjects. For the sake of this study, we first provide a description of distributives and non-distributives in Figure 3.1, adopted from Stirling (1985: 17) (emphasis added). As illustrated, distributivity entails a multiplicity of temporal entities or events, which will be particularly relevant to the following discussion.

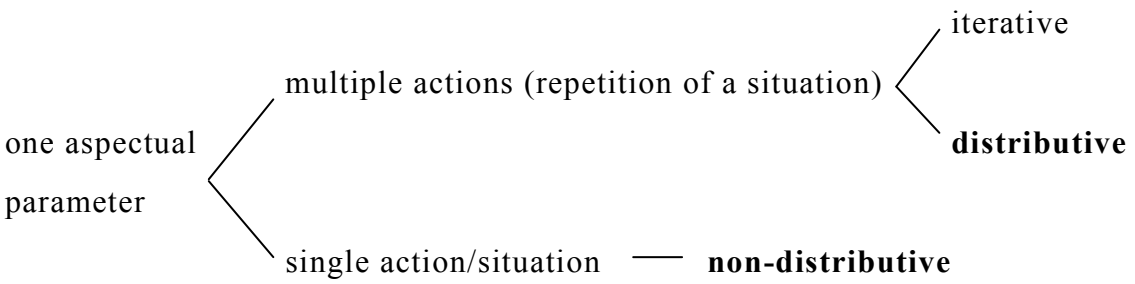


Figure 3.1. Generalization over distributive and non-distributive readings Stirling (1985: 17).

The terms *distributive* and *non-distributive* are used throughout our discussion in the sense of Kitagawa and Kuroda (1992). Note that their usage of distributivity in relation to action or situation in fact seems somewhat different from the one commonly used in the literature of semantics (see Landman 1989, 2000; Kobuchi 2003, 2007; Tancredi 2005; Nakanishi 2004, 2007, 2008).

It is, however, not entirely clear whether the distributivity in question can be defined only in terms of agent (rather than event) to account for all the

FNQ facts (see (1.3) (Chapter 1) and the data in section 3.1.2). One important aspect concerning distributivity and its construal is that there are cases wherein distributivity appears to involve distribution of events (single or multiple), rather than agents (see also section 3.1.2 below). Although this type of distributive reading is contrasted with a non-distributive (or collective) reading in the literature, regardless of the definition (agents or events) chosen, the distributive reading must be identical in the analysis of FNQ constructions. However, this is not established by examples (1.3) and (1.4). Therefore, it seems reasonable to continue using Kitagawa and Kuroda's definition of distributive readings in relation to events rather than agents.[38]

Another reason why we adopt Kitagawa and Kuroda's definition of distributivity is Kratzer's (2005: 136) claim that the true source of distributivity could be a non-overt operator that obligatorily co-occurs with the (apparent) quantifier. According to this hypothesis, if there are non-overt distributivity operators, distributivity inherent to FNQ constructions would be elusive rather than categorical. Inherent quantificational force and distributivity are not always the key elements of quantifier expressions.

There is evidence to support this hypothesis in English. Consider, for example, (3.1) taken from Beghelli and Stowell (1997: 87).

(3.1)
John and Bill visited Mary.

Beghelli and Stowell account for the sentence meaning of (3.1) as follows: On the distributive reading, *John* and *Bill* are 'each agents of distributive events involving visits' to *Mary*; on non-distributive reading, *John* and *Bill* act together as "joint agents of a single visiting event." To explain these readings, Beghelli and Stowell assume that there is a covert existential

[38] We also use the term "non-distributive" when citing examples and arguments by previous authors who used this expression.

quantifier over events in the sentence, as has been suggested by Davidson (1967), Kratzer (1995, 2005), and others; an existential quantifier falling under the scope of the subject QP (or DP) results in a distributive reading; if the non-overt existential quantifier takes a broad scope (e.g., outside the scope of the subject QP), the distribution fails and a collective interpretation results. Similarly, in section 3.1.4 we argue that different readings of FNQs can be reduced to issues of scope.

Based on the distinction between distributivity and non-distributivity shown in Figure 3.1, we next consider the correlation between the distributive or non-distributive contrasts in conjunction with partitive or non-partitive denotations. Identifying the ambiguity of these four related readings clarifies what has been lacking in previous studies and provides an empirical basis for reaching a better understanding of FNQ interpretation.

3.1.2 Distributive and non-distributive FNQ readings

In light of examples (1.3) and (1.4) (in Chapter 1), the phenomenon referred to as the distributive or non-distributive distinction appears to be relevant to a more general discourse-pragmatic system. As described in Chapter 4, in principle, an FNQ expression gives rise to a set of possible interpretations; hence, resulting in ambiguity. It is then likely that a hearer is able to identify one optimal interpretation for the FNQ expression in relation to the context.

It has been generally assumed that a quantification that ranges over the extensions of a noun is called distributive (in particular, see Kobuchi 2003, 2007; Nakanishi 2004, 2007, 2008). However, as discussed in 3.1.1, Kitagawa and Kuroda (1992) define distributive reading in terms of reference to events.[39]

[39] Kitagawa and Kuroda's (1992) aim was not to present a complete theory of Japanese FNQs; nevertheless, the present study draws upon their work because it offers important empirical insights in considering the interpretation of FNQ sentences (see Nakanishi 2007, 2008 for criticism).

Below we present some data from their work. A distributive reading necessarily implies the occurrence of multiple events, while a non-distributive reading implies the occurrence of a single event. Kitagawa and Kuroda's (1992: 68–9) examples used to illustrate the contrast are as follows:

(3.2)

a. **Distributive**

Kono isshuukan no aidani **shuujin ga** *san-nin* nigedashita.
this one week Gen during prisoner Nom three-Cl escaped
'There have been three jailbreaks this week.'

b. **Non-distributive**

Sonotoki totsuzen **shuujin ga** *san-nin* abaredashita.
then suddenly prisoner Nom three-Cl started.to.act.violently
'Then, a group of three prisoners suddenly started to act violently.'

According to Kitagawa and Kuroda's description of distributivity, ((3.2) a) is distributive and ((3.2) b) is non-distributive because in the interpretation of ((3.2) b) there is only a single event of violent behavior by three prisoners. More precisely, ((3.2) a) is distributive (each member of the set of prisoners is the agent of an event of escaping) and ((3.2) b) is non-distributive (all the prisoners act as a collective agent behind a single event of starting to act violently).

However, as Ishii (1999) points out, ((3.2) b) has a distributive reading in addition to its non-distributive reading. That is, ((3.2) b) can be interpreted as distributive since *started to act violently* applies to each prisoner, even if the actions of the three prisoners occurred suddenly and at the same time. This observation seems valid because the quantification in question can range over the extensions of a noun (see Chapter 4 for more discussion); hence, more careful attention is needed to provide a better account of FNQ interpretation.

3.1.3. Partitive and non-partitive FNQ readings

In this subsection, we consider the partitive and non-partitive interpretations appearing in FNQ constructions.[40] Kitagawa and Kuroda (1992) claim that a contrast in meaning sometimes shows up between "local" and "non-local" quantifier floats (see ((1.1) b, c) in Chapter 1).

(3.3)
Local quantifier float permits either partitive or non-partitive interpretation, whereas non-local quantifier float permits only partitive interpretation.

(Kitagawa and Kuroda 1992: 70)

With their descriptive generalization (3.3), Kitagawa and Kuroda contend that this contrast is observed only when the floating quantifier is intended to be non-distributive, as stated in (3.4) (Kitagawa and Kuroda 1992: 70).

(3.4)
Non-distributive

a. Mukoo kara arui-te-kita **gakusei ga** *huta-ri* boku no me no mae de
there from came.on.foot student Nom two-Cl I Gen in.front.of
keisatsu ni taihos-are-ta.
police by arrest-Pass-Past
'Two students / two of the students walking toward me were arrested by the police.'

[40] This study uses the terms *partitive* and *non-partitive* as equivalent to *non-exhaustive* and *exhaustive*, respectively.

b. Mukoo kara arui-te-kita **gakusei ga** boku no me no mae de
there from came.on.foot student Nom I Gen in.front.of
keisatsu ni *hutari* taihos-are-ta.
police by two-Cl arrest-Pass-Past
'Two of the students walking toward me were arrested by the police.'

Kitagawa and Kuroda observe that when an FNQ prompts a distributive reading, the contrast does not appear, as the English translations indicate. However, as observed in ((3.2) b), sentence ((3.4) b) also permits a partitive (distributive) construal rather easily for the same reason; this fact should not be overlooked.

Let us now turn to a distributive construal (taken from Kitagawa and Kuroda 1992: 69).

(3.5)

Distributive

a. Senshuu, soshite konshuu to sooko ni nokotteita **kuruma ga**
last week and this week warehouse in remaining car Nom
ni-dai doroboo ni nusum-are-ta.
two-Cl thief by steal-Pass-Past
'With the break-ins that took place last week and this week, two cars / two of the cars left in the warehouse were stolen.'

b. Senshuu, soshite konshuu to sooko ni nokotteita **kuruma ga**
last week and this week warehouse in remaining car Nom
doroboo ni *ni-dai* nusum-are-ta.
thief by two-Cl steal-Pass-Past
'With the break-ins that took place last week and this week, two cars / two of the cars left in the warehouse were stolen.'

According to Kitagawa and Kuroda, both ((3.5) a) with local quantifier

float and ((3.5) b) with non-local quantifier float are deemed ambiguous with respect to partitive and non-partitive interpretations, as the corresponding translations indicate. However, Kitagawa and Kuroda's observation is not correct concerning ((3.5) b). The non-partitive interpretation given in the translation (i.e., two (and only two) cars left in the warehouse were stolen) is not easily obtained. In addition, there are certain cases wherein a non-local FNQ yields only a non-partitive distributive reading, as shown in the following elaborate example (Takami 1998(1): 91).

(3.6)

A: Kono shinkan zasshi urete-imasu-ka.
this new magazine selling-is-Q
'Is this new magazine selling well?'

B: Ee, kesa mo **gakusei-san ga** sore o *go-nin* kat-te iki-mashita-yo
yes this morning also student Nom it Acc five-Cl buy go-Past
'Yes, five students have bought it this morning.'

Ishii (1998) claims that utterance ((3.6) B) has only a distributive (or cumulative) reading. In this discourse, according to Ishii, there is no predefined set of students, and hence, *go-nin* "five-Cl" does prompt a partitive reading. In Chapter 4, we see that an NP-related FNQ can function as a maximality operator (*iota*, in formal semantic terms), which entails that the FNQ takes the maximal member of the given set (see Giannakidou and Cheng 2006 for description), which is interpreted as non-partitive.

From ((3.5) b) and ((3.6) B), we can deduce that a partitive or non-partitive reading is not guaranteed by an FNQ construction. In other words, the placement of the FNQ after the case particle *-ga* "Nom" does not guarantee the possibility of a partitive interpretation (see Watanabe 2006, 2008 for a

syntactic account of this point). A partitive interpretation is often prosodically signaled with marked intonation including pausing (Kitagawa and Kuroda 1992; Ishii 1998, and see section 4.1.4). Undoubtedly, inferences about scenarios or contexts have affected the interpretation of FNQs as partitive or non-partitive in (3.6). This means that the interpretation of FNQs (in particular, with regard to partitive vs. non-partitive readings) is more discourse related than previous studies have supposed.

It is not clear, then, how Kitagawa and Kuroda address the difference in interpretation with regard to partitive vs. non-partitive readings in ((3.5) b) and ((3.6) B) by relying on their generalization in (3.3). This generalization incorrectly predicts that a non-local quantifier float with a "distributive" reading permits either a partitive or a non-partitive interpretation. We must admit that (3.3) is not an effective example to illustrate all the interpretive facts involving FNQs, local or non-local.

To address these considerations, we suggest that in principle (at least) four readings are possible in local or non-local FNQ constructions, as Table 3.1 summarizes.[41] The binary features [+/−part(itive)] and [+/−dist(ributive)] can exhaustively define the FNQ constructions that we set out to explore in the following chapters. Note that in an FNQ sentence semantics generates both of the possible readings of quantifiers and preference is determined by pragmatics.

[41] Table 3.1 is not yet complete. Although Kitagawa and Kuroda (1992) do not discuss this, examples such as (1.3) and (1.4) would fill the empty slots, i.e., non-local FNQs with [-part, -dist] (non-partitive non-distributive reading). We will see further evidence for the presence of this kind of FNQ sentence in section 4.3 (Chapter 4) and in section 5.4 (Chapter 5).

Table 3.1 Distribution of interpretations of Japanese FNQs

	+part, +dist	−part, +dist	+part, −dist	−part, −dist
Local FNQ e.g., (1b)	(3.2) a, (3.2) b, (3.5) a	(3.5) a	(3.2) b, (3.4)a	(3.4) a
Non-local FNQ e.g., (1c)	(3.4) b, (3.5) b	(3.6) B	(3.4) b	? (to be filled)

As shown in Table 3.1, there are in principle at least four possible interpretations regarding the partitivity and distributivity assigned to local and non-local FNQs. What we would like to determine is which successful derivation leads to the intended reading. It is noteworthy that non-distributive examples such as ((3.2) b), ((3.4) a, b), (1.3), and (1.4) are often considered problematic by previous studies, which commonly assume that the FNQ obligatorily functions as a verbal modifier (i.e., a quantifier over events) and systematically yields distributivity as the default reading. These assumptions, as well as other examples below (see Kobuchi 2003, 2007; Nakanishi 2004, 2007, 2008, among others), need to be modified before they can be incorporated. This study calls this traditional assumption into question. In section 4.3 (Chapter 4), we argue that the non-distributive FNQ reading in fact emerges under certain conditions.

As discussed in section 3.1.1, whether we define the meaning of distributive reading in terms of reference to individual objects (agents) or events (situations), observations by researchers including Kitagawa and Kuroda (1992), Ishii (1998, 1999), Takami (1998) are correct and still deserve careful attention. It is important to note that both (non-)distributivity and (non-)partitivity play an important role in the felicity of FNQ sentences, whether they are local or non-local.

As can be seen from Table 3.1, FNQ constructions do not necessarily guarantee a distributive reading in terms of reference to agents (contrary to

what previous studies have concluded). This is presumably because there are two types of FNQs in Japanese (i.e., object-related and event-related quantifiers); both have distinct structures, interpretations, and intonations. That is, FNQs are primarily associated with either the subject NP (adnominal FNQs) or the verb (adverbial FNQs). Hence, it is not easy to characterize FNQs simply in terms of agents. Furthermore, we must consider the fact that the interpretation of FNQ sentences is influenced by pragmatic effects.

3.1.4 Scope of FNQs

It merits mention here that different FNQ interpretations can be reduced to different scope interpretations, although the basis for this idea is not new (see Hajičová et al., 1998; Steedman 2000a, b; Kempson 2001, 2005). It is widely accepted that when there is more than one quantified expression in a sentence, the interpretation of the sentence can be ambiguous due to the different scopes projected by the multiple quantifiers; information structure often plays an important role in determining scope (Kuno et al. 1999).

Krifka (2006: 107) maintains that measuring the scope of quantifiers and determining the focus operators and their position seems to require similar manipulations of enrichments of syntactic structure or semantic interpretation. The quantifier or focus expression must be identified and then connected to a position within the scope. Therefore, it seems natural to posit the same mechanism for scope measurement and focus association. This postulation is important for this study (see section 6.4 (Chapter 6)).

There are some studies dealing with scope relations in a functional perspective. For example, Van Valin and LaPolla (1997) discuss the issue on the basis of data compiled from different languages and claim that it is largely conditioned by focus structure. They propose the following principle, as stated in (3.7).

(3.7) **Principle constraining the interpretation of quantified NPs:**

Topical quantified NPs have scope over focal quantified NPs,

i.e., topical Q⊃ focal Q (Van Valin and LaPolla (5.20))

To see the functionality of this principle, we consider an example from Kuno et al., (1999) (taken from Van Valin (2005)).

(3.8)

a. Every girl KISSED A BOY. (= Each girl kissed a different boy ("for each girl there is a boy such that the girl kissed the boy," i.e., ∀ ∃))

b. EVERY GIRL kissed a boy. (= Each girl kissed the same boy ("there is a boy such that for each girl, the girl kissed the boy," i.e., ∃ ∀))

The principle (3.7) states that (everything else being equal) a topical quantifier has wide scope over a focal quantifier (see Van Valin 2005 for discussion). This in turn predicts that in a sentence like *Every girl kissed a boy*, the default interpretation should correlate with the default focus structure, predicate focus (Lambrecht 1994), depicted in ((3.8) a). Since the universal quantifier is topical and the existential quantifier is focal in ((3.8) a), the preferred reading should be that of ((3.8) a), which is correct. To obtain the second reading in ((3.8) b), it is necessary to interpret *Every girl kissed a boy* as if it were a narrow focus construction, as shown in ((3.8) b). In this case, the existential quantifier is topical and the universal quantifier focal. Consequently, the former has a wide scope, yielding the interpretation shown in ((3.8) b). The scope relation observed above is intuitively clear. In accordance with this approach to scope interpretation, we address the heart of the issue and its association with focus identification in Chapter 6. In this chapter this method of accounting for quantifier scope ambiguity works well in a system that derives syntactic and semantic representations in tandem rather than parallel (see Chapter 6).

We extend the above discourse-pragmatic constraint to the analysis of FNQ constructions and argue that different scope interpretations are caused by different FNQ types. Semantic distinctions, which would be realized by distinct prosodic patterns, are correlated with different quantifier scope readings. It could be that the default reading of FNQs is distributive, although a non-distributive reading is available in the appropriate context.[42] By way of illustration, we take up the familiar example (1.3), wherein scope relation is indicated in square brackets immediately after the English translation.

(1.3)

Gakusei ga (//) *go-nin* tsukue o mochiageta.

student Nom five-Cl desk Acc lifted

(i) 'Five (of the) students lifted a desk (individually).' [Sbj > FNQ]

(ii) 'Five students lifted a desk (together)' [Sbj < FNQ]

(cf. Nakanishi 2007, 2008)

The current analysis of quantifier scope in FNQ sentences, consonant with the functional scope statement in (3.7), follows de Swart (1996) in that indefinite NPs are interpreted as existential quantifiers (see de Swart (1996) for discussion). The inverse scope reading illustrated in (1.3 (ii)), corresponding to a non-distributive reading, can be represented via a linear reading, wherein *go-nin* "five-Cl" outscopes *gakusei* "student." This linear reading is obtainable indeed in the designated scope statement. Admittedly, in the wrong context, such a linear reading might not be the most desired one, as the equivalent (or co-existing) reading e.g., *gakusei* outscopes *go-nin* in (1.3 (i)), also exists.

[42] The default reading means that speakers naturally produce the phonologically optimal sentence (i.e., the default sentence stress) and not the less often used one (see Pierrehumbert and Beckman 1988 for an explication of default sentence stress). This means that, in general, readers show a slight preference for the VP-related reading of ambiguous FNQ constructions. A possible reason for this VP-attachment preference may be the lack of punctuation in the sentences. This would be the case in Japanese because in a written context, an NP-related reading is not typically signaled by any marker such as a comma before FNQs (see Chapter 5 for relevant discussion).

However, the existence of equivalent readings does not clearly justify the non-existence of certain interpretations (here non-distributive readings).

When we grasp the contextual prosody and attempt to process the FNQ sentence, we can render available the scope interpretation apparently unavailable in written examples.[43] Hence, the NP-related FNQ probably offers a normal rather than exceptional prosodic pattern. Here again, the correlation between pragmatics and semantics is not arbitrary. Three properties pertaining to the FNQ construction, i.e., prosodic patterns, pragmatic functions, and scope readings—are coherently related to each other (see section 6.4 for a formal account of FNQ sentences).

The co-existing (dual) view concerning the two different interpretations is reflected in the assumption that in principle more than one reading is possible through the combination of [+/− distributive] and [+/− partitive] in local or non-local FNQ constructions, as discussed in sections 3.1.1–3.1.3. The experiment that we conduct suggests that many speakers agree that FNQ sentences may take a wider scope and easily receive a non-distributive reading, as long as the prosody and information structure are appropriate (see section 5.4 (Chapter 5) for a report on this study's perception test).

The scope of FNQ expressions will be determined by a set of factors, but there are still ambiguous cases with respect to scope. This is presumably because in terms of lexical semantics the subject-FNQ fragment (combined with the verb phrase meaning) can be interpreted either as a group of specific individuals or an aggregate (see Takano 1992; Kobuchi 2003; Amazaki 2005 for related discussions). For instance, when the subject noun *gakusei* "student(s)" in (1.3) above is interpreted as a group of individuals, a distributive reading is assigned to *the students*, resulting in "five desks per student." By contrast, when it is an aggregated group, a distributive reading is

[43] As mentioned above, following de Swart's (1996) claim that indefinite NPs are interpreted as existential quantifiers, we render scope relations between the subject noun and the associate FNQ as scope statements of the form $x<y$, expressing that the term involving variable y has scope over it involving x (see also Kempson et al. 2001: Chapter 7).

not likely and a non-distributive reading may be preferred. Prosody will ultimately determine which scoping is chosen and determine the information structure role of the constituents.

3.1.5 Quantificational and referential use of FNQs

There is a semantic property that deserves some attention when we consider the two types of FNQs. We posit that there are two ways of interpreting Japanese FNQs: one is "quantificational" (with denotation of type <<*e*, *t*>, *t*>; e.g., *three persons*), and the other is "referential" (with denotation of type *e*; e.g., *that man*) (see Fodor and Sag 1982; Chierchia 2005; Abbott 2010 for details).[44]

The emerging picture to be demonstrated is as follows. As the first step for building a more fine-grained semantics or pragmatics of FNQ constructions, it is important to take into account that the FNQ can be used in two ways: on the one hand, it is quantificationally used and refers to the specific individual that the speaker had in mind with their use of the indefinite antecedent of the FNQ.[45] On the other hand, it is used referentially and refers to the exhaustive group of individuals that satisfies the description given in the sentence in which the antecedent occurs.

When equally analyzed as referential NPs, NP-related FNQs are believed to possess "specific" or "referential" uses in relation to a particular context (see Reed 2009 for a similar analysis of English floating quantifiers). In such uses, FNQs are also similar to definite NPs (see section 4.2.7 (Chapter 4) for discussion). Note that such parallel effects do not necessarily mean that they have an identical status with respect to interpretation. One might claim

[44] According to this view, referential NPs (or QPs) must not be understood simply as linguistic constituents that "refer" in some pretheoretical sense, but as constituents whose semantic denotation (in appropriate and felicitous contexts) is of the same type as that of individuals (see Fodor and Sag 1982, and Abbott 2010 for relevant discussion).

[45] Pronouns are anaphoric with regard to something already contained in the discourse, and therefore, cannot be new information (Erteschik-Shir 1997, 2007).

that NP-related FNQs, as reflected in their intonation (or perhaps haphazard punctuation), are less well integrated into the sentence; such examples were thus previously regarded as exceptions or marked expressions by researchers.[46] However, this line of analysis is incorrect, as will be seen in section 4.2.5 (Chapter 4).

To better deal with the subtle issue related to FNQ readings, we argue that an interpretation of the non-distributive uses in which an FNQ contributes to a non-restrictive interpretation involves modification of something like a referential noun, or even a definite description (i.e., the NP whose determiner is the definite article *the*, e.g., the King of France, the book). The underlying assumption is that, as discussed at length in section 4.2.7 (Chapter 4), the NP-related FNQ displays some similarities with a non-restrictive modifier, which is predicated like a definite description. Such a modifier will hence receive an interpretation that loosely reflects E-type anaphora, even though the materials (i.e., antecedent and anaphor) are contained within a single clause. This process results in a different interpretation than a VP-related FNQ. Endeavoring to assemble this sort of interpretive means will be a step toward a more adequate treatment of FNQ explanations.

3.2 Prosody

As implied in section 3.1, the interpretation of FNQ sentences is well described in prosodic terms (intonation), and a theory based on prosody should explicitly explain the FNQ interpretation in (1.3). The key to understanding FNQ interpretation is the awareness of distinct intonational patterns between VP-related and NP-related FNQs.[47] Our concern is what happens when two

[46] Another possibility is that the variation among speakers may indicate that some speakers exclusively use VP-related FNQs, rather than NP-related FNQs. Therefore, it is likely that an FNQ is favored by intonational variation, regardless of whether context can disambiguate the potential ambiguity, and speakers produce only intonational phrasings in conformity with VP-related FNQs. However, this does not always obey the likelihood, as discussed in sections 5.3 and 5.4 (Chapter 5).

[47] Intonational variation has been much studied in its role in the interpretation of numerous

potential accent phrases (APs) (for example, the FNQ and its host noun) combine. In general, when the two phrases form a syntactic and semantic unit, the combination of a sequence as a single AP (and intonational phrase (IP) as well) is possible, as long as neither component is emphasized (Pierrehumbert and Beckman 1988: 27–8; Kubozono 1993: 131–2). This is the basis for our prosodic account of FNQ constructions to be developed in sections 5.3 and 5.4 (Chapter 5).

3.2.1 Prosodic effects on FNQ interpretation

In this study, we examine meaningful ways in which information structure in Japanese FNQs is influenced by intonation.[48] We describe the two prosodic structures that could distinguish VP-related FNQs from NP-related FNQs. We consider an example like (2.5), repeated here as (3.9). In general, the listener tends to group lexical materials into a prosodic package and she or he determines the start and end of each package on the basis of prosodic information, especially relevant F_0 (fundamental frequency) register scaling (e.g., downstep or pitch register reset), wherein the pitch range is sensitive to information structure (e.g., the enlarged pitch range for new information and the compressed one for given information) (Fodor 2002; Kitagwa and Fodor 2006; Féry and Ishihara 2009, among others).[49] In addition, as Pierrehumbert

---

discourse phenomena. We assume that FNQs are differently interpreted depending upon whether they are prominent in varying contexts. Different categories of information status, such as theme or rheme distinctions, given or new status, and contrast are believed to be intonationally markable (Jackendoff 1972, 1997; Chafe 1976; Prevost 1995; Steedman 2000a, b, 2012). We see in Chapter 5 cases wherein prosody provides important indications of informational structure, and information structure roles are aligned to phrase structure.

[48] The current study focuses on subject-related FNQs and examines their interpretive behaviors in prosodic terms. For an experiment involving prosodic phrasings on subject-related and object-related FNQs, see Miyagawa and Arikawa (2007: Section 7).

[49] It is generally held that F0 of speech sounds tends to decrease over the course of an utterance, and the literature has identified two major prosodic events, other than downstep, as the main causes of this tendency. One is a phonetic effect of "declination"— F0 gradually declines from the beginning of the utterance as a function of time. The other is a phonetic rule of "final lowering," which significantly lowers F0 at the end of each declarative utterance (Poser 1984; Pierrehumbert and Beckman 1988; Kubozono 1993; Ishihara 2007, 2011). The point of the current discussion is that there is a prosodic distinction depending on

and Beckman (1988: 7, 19–20, 99–101) point out, focus creates a prosodic boundary before the focused material and at the same time destroys the ones following it. When pronounced, a pitch reset is observed on the FNQ *san-nin* 'three-Cl' in ((3.9) a), while a downstep (rather than a pitch reset) is observed on the FNQ in ((3.9) b).

(3.9) (=(2.5))

a. ??**Gakusei ga** kinoo // *SAN-NIN* Peter o koroshita. (= (2.5) a)
student Nom yesterday three-Cl Peter Acc killed
'Three students (each) killed Peter yesterday.'

b. **GAKUSEI GA** kinoo *san-nin* // Peter o koroshita. (= (2.5) b)
student Nom yesterday three-Cl Peter Acc killed
'Three students (as a group) killed Peter yesterday.'

In previous studies, Japanese FNQ constructions have been presented in written form and interpreted without any context. This approach would be problematic for the present study because the information structure of a sentence is affected by context, prosody, or both. Such a reading test with written stimuli is necessarily based on self-paced reading, which often only reflects readers' default prosody (Kiaer 2005: 7). In the reading test, marked (non-default) prosody cannot be immediately incorporated in the general theory of FNQ constructions. To resolve this problem, we should first examine the data on FNQ constructions provided in the existing literature. For further empirical coverage, this study re-examines the data and conducts a perception test to examine whether prosody clearly affects the interpretation of FNQ sentences, and formulates a theory of FNQs that takes into account the relevant context and prosody.

---

the presence or absence of a sharp pitch reset on the FNQ.

3.2.2 Prosody and focus in FNQ constructions

As briefly discussed in section 3.1, many FNQ examples deemed ungrammatical by researchers are in fact grammatical, and contrary judgments are probably due to a failure to assign the appropriate prosodic contour. This may be a type of clash between the prosody that is required for an NP-related FNQ interpretation and the default intonation (which yields a VP-related FNQ interpretation) that a reader or listener may automatically assign.

Restricting our attention to cases involving a subject-oriented FNQ, we suggest that quantifier float potentially gives rise to ambiguity between distributive and non-distributive readings (see (3.10) below). To clarify, we will consider another case involving non-distributive readings, as in (3.10) below. Kobuchi (2003, 2007) and Nakanishi (2004, 2007, and 2008) point out that a sentence like (3.10) is impossible. The judgement is Nakanishi's, based on the assumption that a distributive reading is not available for this FNQ construction. According to her theory, despite a pragmatic need for a collective reading, only a distributive reading is assigned to the sentence as the FNQ is located within the VP.

(3.10)[50] (cf. (1.4))

***Kodomo ga**	kinoo	*san-nin*	sono inu o	koroshita.
children Nom	yesterday	three-Cl	that dog Acc	killed

'Three (and only three) children killed the dog.'

As pointed out in section 2.2 (Chapter 2), the grammatical assessment of existing research seems problematic mainly because the sentences are provided without any particular context. As we saw in ((3.9) b), sentence (3.10) can

[50] Kobuchi (2003, 2007) makes use of "*" (ungrammatical), rather than "#" (infelicitous) in her account. This reflects the intuition of several native speakers that many of these examples sound ungrammatical and cannot be improved by context. However, this claim seems too strong (see (1.4)).

become felicitous, even if it is initially considered in an impossible "out-of-the-blue" context.[51]

For instance, one can easily imagine a possible context in which sentence (3.10) is uttered during the discussion of an awful incident, in which that dog has been killed by someone. Here, *sono inu o koroshita* 'killed that dog' is regarded as the topic rather than the focus. What is emphasized is the subject noun, *kodomo* 'children'. In this situation, the FNQ *san-nin* 'three-Cl' is the non-focus element, which is defined as neither topic nor focus (see Valludví 1992; Lambrecht 1994; Butt and King 2000; Dalrymple and Nikolaeva 2010 for discussions of information structure roles).[52] Miyagawa and Arikawa (2007: 661-2, footnote 9) note that acceptability improves if a pause is inserted immediately after the FNQ.[53] This is the assessment of informants when sentences are auditorily presented with controlled prosodic properties. Importantly, the FNQ in (3.10) can be phrased (non-locally) together with the subject, giving rise to a larger single downtrend intonation contour as shown in ((3.11) a) below. (See Chapter 5 for more discussion of the prosodic phrasing pertaining to FNQ construction.)

3.2.3 Improvement of acceptability by prosody

The prosodic account developed in this study could be viewed as an extension of the claim made in Miyagawa and Arikawa (2007) that prosody plays a crucial role in interpreting FNQ constructions.

To objectively examine data on FNQ interpretations with differing intonational patterns, we asked one of the informants to read aloud sentences

[51] As discussed in the literature (Lambrecht 1994; Kahnemuyipour 2009; among others), what is referred to as default or neutral intonation is perhaps best described as an all-new or out-of-the-blue utterance, that is, one where everything is focus marked.

[52] The distinction between focus and non-focus is comparable to Halliday's (1967) "new" and "given" information. A general notion adopted here is that a focused expression is an informative part of the sentence, while a non-focused one is uninformative (see also Butt and King 2000 for a detailed discussion of information structure roles).

[53] In the examples below, we assume that the verb is read without any prosodic addition (or particular additional intonation contour), such as an emphasis or focus.

involving FNQs with context (these were recorded and are presented in section 5.3 (Chapter 5)). It is plausible that the strategy used by the speaker to avoid infelicitous readings was to form a single downtrend IP composed of the FNQ and its host noun within the same NP. As discussed in detail in section 5.2 (Chapter 5), this single phrasing is characterized by the accompaniment of lowered F0-peaks (i.e., downstep), rather than a sharp F0-rise on the pitch contour (i.e., pitch resetting). This lends support to our prosodic-based analysis of FNQ constructions.

Provided with contextual information, the interpretation and acceptability of sentence (3.10) changes, as does the prosodic pattern we can assign to it. For clarification, we further consider ((3.10) a). In (3.11) relevant intonational units are shown in square brackets to facilitate exposition.

(3.11) (cf. (3.10))

a. [**Kodomo ga** kinoo *san-nin*] // sono inu o koroshita
children Nom yesterday three-Cl that dog Acc killed
'Three (and only three) children killed the dog.'
(cf. Miyagawa and Arikawa 2007)

b. ***Kodomo ga** kinoo // [*san-nin* sono inu o koroshita]
children Nom yesterday three-Cl that dog Acc killed
'Three (and only three) children killed the dog.'
(cf. Nakanishi 2004; Kobuchi 2006)

The FNQ and its associate NP in ((3.11) a) do not form a separate prosodic phrase. By contrast, in ((3.11) b) the quantifier, prosodically separated from the host NP, resides within the VP's intonational domain, resulting in an infelicitous reading for an NP-related (or non-distributive) FNQ. In this case, an "unmarked" VP-related (or distributive) reading is not available either, because of the semantic incompatibility ascribed to the meaning of the once only predicate *korosu* 'kill'. Here, we must observe that unlike example ((3.11)

b), the quantifier is computed within the NP rather than the VP, which is the optimal interpretation available for ((3.11) a). Furthermore, Chapter 5 focuses on how prosodic boundaries or pauses— independent string elements in their own right—are appropriately represented in FNQ intonation, which most previous studies have failed to address. Prosody is shown to be a determining factor in the position and interpretation of the FNQ.

In the absence of further context and intonational cues, it stands to reason that different readings as observed in ((3.11) a) and ((3.11) b) would arise simply as the result of a difference between the lexical content of the sentences and their respective contexts. There appears no structurally based, mechanical way in which correct interpretations are derived successfully, although different readings involve different truth conditions.[54] We should note that the result of the speakers' judgment concerning ((3.11) b) indicates that the VP-related FNQ reading is less natural because it would require heavier contextual framing to be felicitous. As exemplified in ((3.11) a), it is highly probable that the NP-related reading (rather than the VP-related one) is the preferred option under a given condition. However, previous studies do not discuss the role of context in processing FNQ sentences like (3.10), nor do they answer the question as to whether or how an FNQ can become the preferred structure and meaning in an otherwise potentially ambiguous structure.

3.3 Summary

Discussion of the interpretive issues related to ambiguity and prosody outlined in this chapter has indicated that FNQs are ambiguous, offering both distributive and non-distributive readings. The underlying assumption is that from a sentence processing perspective, in nearly all cases involving an FNQ, FNQ sentences would be considered ambiguous with distributive and

[54] For a general discussion on the truth-conditional meaning depending on context and world knowledge, see Bluntner 2000 and Hendriks and de Hoop 2001.

non-distributive readings both possible (see also section 3.1.1).[55] An FNQ interpretation must be closely related to a given information structure and prosody. We indicated that prosody must be consistent with the information structure imposed by the context; prosody therefore needs to be granted a major role in syntactic research. We also pointed out that existing theories do not seriously take non-syntactic factors into account and likewise fail to cover a range of FNQ aspects, in particular, non-distributive readings. In the next chapter, such apparently marked readings of FNQ constructions are shown to be closely associated with NP-related FNQ structure, a matter on which little research has been conducted. In light of our discussion in this chapter, we explore FNQ interpretation from two perspectives. One is syntactic and semantic (Chapter 4) and the other is pragmatic and prosodic (Chapter 5).

[55] As Kobuchi (2003, 2007) notices, the distinction between these two interpretations can be sensed in silent reading only when we succeed in mentally associating them with distinct prosodic patterns as in (i) and (ii), wherein "//" indicates pauses. Note that both are possible prosodic phrasings of sentence ((1.1) b) in Chapter 1:

(i) [[*Gakusei ga san-nin* //] *kita*].

(ii) [*Gakusei ga*] // [*san-nin kita*].

This situation, however, is not as simple as Kobuchi assumes (see Chapter 5 for further discussion).

CHAPTER 4

Structure and Meaning of FNQ Constructions

This chapter concentrates on the syntax and semantics of Japanese FNQ constructions. A major portion of this chapter is devoted to validating the distinction between the two types of FNQs in order to fully explain FNQ placement and interpretation. Syntactically, this distinction is plausible provided that flexible structuring is allowed in the syntax of Japanese and that each realization is associated with particular readings.

It is argued that, semantically, what is crucial to the distinction between the two types of FNQs is whether an FNQ is interpreted via quantification or reference. This distinction is required when variance in FNQ interpretation is considered. In particular, it is shown that NP-related FNQs have much in common with referential(-like) nouns, functioning as discourse anaphoric items.

A tripartite quantificational structure (Heim 1982, and Partee 1991) is also introduced as a core interpretive mechanism required for representing FNQ semantics adequately. This mechanism integrates information structure into quantification. The analysis of FNQ syntax and semantics proposed is advantageous in that the tripartite quantificational representation, in accordance with focus/non-focus partitioning, is helpful in accounting for the FNQ construction viewed as a focus phenomenon whose interpretation is crucially contingent upon information status in the context.

4.1 Syntax of FNQ constructions

4.1.1 Overview

As discussed in previous chapters, in Japanese there are at least two

types of FNQs, i.e., VP-related and NP-related FNQs. In this section, we will focus on the systematic difference between VP-related and NP-related FNQs, which supports the hybrid approach to FNQ constructions (see section 2.1 (Chapter 2)).

As the first step, we examine how our grasp of the grammar of a construction goes forward with its meaning when processing Japanese FNQ sentences. In so doing, we address the issue of compositionality; anything that is a constituent in the syntax is a constituent in the semantics, and vice versa (see Nakanishi 2004, 2007 for discussion of compositionality in a different framework, with different research questions and results).

There is a problem with previous studies assuming only one syntactic structure (e.g., the adverbial or adnominal approach to FNQs), since such a position makes the syntax-semantics interface unnecessarily complex, and fails to cover FNQ data involving non-distributive interpretations.[58] Kobuchi (2003, 2007) and Nakanishi (2004, 2007, 2008) are recent attempts to claim that the FNQ is syntactically and semantically computed only within VP, resulting in a distributive reading, while a non-FNQ can always have a collective reading (a non-distributive reading in our terms) (see also Gunji and Hasida 1998; Amazaki 2005 for similar views).

The above analysis is, however, inadequate to deal with the fact that in certain contexts FNQs can show non-distributivity (see, e.g. (1.3) and (1.4) in Chapter 1). To solve the problem, we show that the occurrence of an FNQ in one of the canonical syntactic positions gives rise to the preferred interpretation, only if the proper syntax and semantics of one or the other of two types of FNQs is provided.

[58] Scope in FNQ constructions (mentioned in sections 3.1.4 (Chapter 3)) may be typical of matters that are of concern in examining the controversial subject of the interface between syntax and semantics, which continues to be important in linguistic theory (see Steedman 2000a, b, 2012; Jackendoff 2007: Chapter 2).

4.1.2. Syntactic properties of two types of FNQs

The present analysis derives syntax from general semantic criteria like almost every major constituency-based generative theory including Government and Binding Theory (and the Minimalist Program), Lexical-Functional Grammar, and Head-driven Phrase Structure Grammar. For instance, the description of the predication or lexical relations of the event/state corresponds to a VP domain in the syntax. The context of that predication relative to some speech time (i.e. tense and perhaps other related inflections) corresponds to sentential domains (and it is also connected with the notion *subjecthood* (see, e.g., Van Valin 2005; Carnie 2008 for more description)).

Unlike syntax-centric architecture, Combinatory Categorial Grammar (CCG) to be employed in this study is not regarded as the central generative capacity in language, from which all productivity in expression may be derived (Steedman 1996, 2000a, b, 2012). In a broader sense, this theory is something like a sophisticated explanatory system for making semantic relations (between the subject noun and FNQ), so that the semantic interpretation can be conveyed phonologically. The syntactic structures provided in (4.1) below make the assumptions about our syntactic structure intuitively clearer.

We will address syntactic/semantic issues by assuming a two-way distinction in the interpretation of FNQs (i.e., NP-related and VP-related), depending on their syntactic position and will make reference to semantic features such as (non)partitive and (non)distributive (see section 4.2.8 for discussion on lexical-semantic representations for FNQs). Example sentence (4.1) is syntactically ambiguous in that it potentially has at least three syntactic structures, as shown in ((4.1) a-c).

(4.1) (= (1.3))

Gakusei ga *go-nin* tsukue o mochiageta.

student Nom 5-Cl desk Acc lifted

(i) 'Five (of the) students lifted a desk (individually).' **[Distributive]**

(ii) 'Five students lifted a desk (together)' **[Non-distributive]**

(Nakanishi 2007, 2008)

Possible syntactic structures for (4.1):

a. [$_{NP3}$ [$_{NP1}$ **gakusei ga**] [$_{NP2}$ *go-nin*]] [$_{VP}$ tsukue o mochiageta]

→ NP-related FNQ: (-part +dist), (-part -dist)

b. [$_{NP1}$ **gakusei ga**] [$_{VP}$ [$_{NP2}$ *go-nin*] tsukue o mochiageta]

→ VP-related FNQ: (+part +dist), (+part -dist)

c. [$_{NP1}$ **gakusei ga**] [$_{NP3}$ [$_{NP2}$ *go-nin*]] [$_{VP}$ tsukue o mochiageta]

→ NP-related FNQ: (-part -dist), (-part +dist)

As can be seen in ((4.1) a-c), the FNQ sentence allows for a range of interpretations. We assume that a sentence like (4.1) potentially has more than one syntactic structure in which the FNQ forms a constituent with the host NP (resulting in an NP-related reading), while the subject NP and FNQ phrase form a constituent with the verbal predicate (yielding a VP-related reading).

Let us take a closer look at the possible structures in (4.1). The FNQ in ((4.1) b) lies in the VP, serves as a VP-adverb, and is responsible for a VP-related quantifier (i.e. quantification is computed within the verbal domain) as many previous studies have claimed. Unlike these studies, we suggest that the binary semantic features [+/− part] and [+/− dist] exhaustively describe the Japanese FNQ constructions (see section 4.2.8 for more details). By means of these semantic features, both partitivity and distributivity play a role in the interpretation of FNQ sentences; in principle four readings are expected: (i)(+part, +dist), (ii)(+part, −dist), (iii)(−part, +dist), (iv) (−part, − dist), which are indicated in the second line of each structure in ((4.1) a-c).

The above analysis of example (4.1), whose possible structures are given

in ((4.1) a-c), at first sight looks like Ishii's (1998, 1999) syntactic analysis in the sense that quantifier float in Japanese allows two distinct types. However, as previously mentioned, the current analysis takes full consideration of relevant discourse-semantic relations, which leads us to assume that an FNQ in the nominal domain serves as an object-quantifier (i.e. non-distributive), while the floating quantifier in the verbal domain as an event-quantifier (i.e. distributive).

More specifically, unlike Ishii (1998, 1999), we assume that FNQs are construed with respect to either the associated noun or verb without positing syntactic constraints. Under our assumptions, every FNQ sentence generates syntactic (and accordingly semantic) ambiguity in principle between distributive and non-distributive readings. One essential strategy to specify an FNQ's type is to provide the sentence with an intonational phrasing in relation to a particular meaning and context, computed from the surface structure (in a compositional manner) (see Chapters 5 and 6 for details).

Note that the syntactic assumptions that we intend to put forward, taking (4.1) as a case in point, maintain compositionality (see also section 4.2.2). Structures in ((4.1) a-c) are considered to be valid, because the quantifier in ((4.1) a) is part of a larger NP *gakusei ga san-nin* 'three students', which constitutes a single morphosyntactic constituent. That is, it is a single nominal projection headed by a quantifier (see, among others, Kamio 1977; Yatabe 1993; Yokota 1999, 2005, 2011; Fukushima 2007). Note, in particular, that ((4.1) c) is newly attested and argued for in this study. This structure, which is considered a variant of ((4.1) a), is essentially the same as that of ((4.1) b) in the sense that the FNQ and its associate NP are split in morphosyntactic constituency. A notable difference, however, lies in the fact that the FNQ in ((4.1) c) is semantically responsible for a NP (i.e. object-quantifier), while the FNQ in ((4.1) b) is responsible for a VP (i.e. event-quantifier), which gives rise to distinct interpretation.

In ((4.1) c), the subject NP presumably has been fronted without altering

its semantic content and is thus separated from the associate FNQ (hence situated outside the same nominal projection) (see, e.g., Grimshaw and Mester 1988; Yokota 2005, 2011 for a detailed discussion of this assumption applicable to other constructions as well). By this displacement, the FNQs in ((4.1) a) and ((4.1) c) are analyzed as arguments of the verb, taking the host noun as its own argument, and they are not typically taken as adverbial, but as adnominal (hence, quantification is calculated in the nominal domain).[59]

The distinction of possible structures exemplified in ((4.1) a-c) above is correlated with prosodic considerations rather than with what is visible in the written form. There are (at least) three phrasing patterns, as shown in ((4.2) a-c), which correspond to the syntactic structures in ((4.1) a-c) above.

(4.2) (cf. (4.1))

a. [$_{NP}$ **Gakusei ga** *go-nin*] // tsukue o mochiageta. (= NP-related FNQ ((4.1) a))

b. [$_{NP}$ **Gakusei ga**] // *go-nin* tsukue o mochiageta. (= VP-related FNQ ((4.1) b))

c. [$_{NP}$ **Gakusei ga** // *go-nin*] tsukue o mochiageta. (= NP-related FNQ ((4.1) c))

The prosodic patterns in (4.2) can be represented (in speech) as follows: First, the NP and the FNQ are in a continuous prosodic unit as shown in ((4.2) a), while in the VP-related reading there is a prosodic boundary between the host noun and the FNQ (located in the VP) as in ((4.2) b). Second, a higher pitch may not be assigned to the FNQ (*go-nin*) in ((4.2) a), while prosodic prominence is located on the FNQ (*go-nin*) as in ((4.2) b).

What is important in the intonational patterns provided in ((4.2) a-c) is that, as will be discussed in detail in Chapter 5, ((4.2) c) is quite similar to ((4.2) a) rather than ((4.2) b), despite the presence of a prosodic boundary (//), realized as an explicit pause. Due to the salient context, the association

[59] The possible structures exemplified in (4.1a-c) can all be captured in a theory like CCG with composition and type raising, which typically allows many more different analyses (or syntactic derivations in CCG) of any given string than other theories of grammar (see Chapter 6).

between the subject NP and the FNQ in the (non-local) NP-related FNQ is reinforced, and the FNQ in ((4.2) c) would be interpreted with respect to quantity denoted by the host noun rather than the predicate.

In the literature, syntactic boundaries are often conceived of as prosodic boundaries. In this connection, Selkirk and Tateishi (1991) claim that the left edge of a Japanese VP is aligned with a phonological domain (see Shiobara 2004 for a similar view). Given this independently motivated generalization, it can be said that the FNQ in ((4.1) a) belongs to the same syntactic domain as the preceding NP, while the FNQ in ((4.1) b) belongs to the same syntactic domain as the predicate following it. This hypothesis makes it possible to provide an account of the fact that (in the unmarked case) the subject NP functions as the topic of the sentence and makes its own prosodic phrase, which is clearly separated from the predicate. However, there are certain cases having a structure like ((4.2) c), where the prosodic pattern is not predictable only from such a syntax-phonology mapping view (see Chapter 5 for further discussion).

4.1.3 NP-related FNQ constructions (preliminary)

Let us turn back to (4.1b) and (4.1c), whose structures are quite similar to each other. Without further contextual clues in the context from intonation, the FNQ is likely to be associated with an unmarked interpretation (i.e. the VP-related FNQ interpretation), which is 'quantificational'.[60] In contrast, in the NP-related FNQ, this marked position for FNQs induces a special semantic effect that is comparable to a (so to speak) 'referential' reading. We would like to call an NP-related FNQ a quantificational expression, even though it parallels a pronoun, on the grounds that its 'meaning' can be analyzed in terms of quantification (see Peters and Westerståhl 2006: Chapters 11 and 12 for an

[60] This point will also be confirmed by sets of intonational data in the experiment in section 5.4 (Chapter 5). We will see that NP-related FNQs look coreferential with the subject NP, and are integrated prosodically (see sections 5.3 and 5.4 (Chapter 5)).

extensive discussion of the relevant issue). More specifically, an NP-related FNQ might not look like a full-fledged quantifier (compared with VP-related FNQs) and it could be used as something like a pronoun which refers to the specific individual or exhaustive group of individuals (in the sense of Downing 1996).[61] However, such an FNQ still semantically retains the full range of quantificational function it serves with the associated (host) noun (see sections 4.2.5 and 4.2.7 below).

The fact that the NP-related FNQ appears to have an 'echoic' flavor in some cases can be explained by assuming that an NP-related FNQ is ambiguous between the definite/referential and the existential interpretations. In the unmarked case, an FNQ sentence yields an existential reading, while in the other case it is considered definite, yielding a partitive/non-partitive reading.[62] As will be discussed later in sections 4.2.5 and 4.2.7, NP-related FNQs are to be accounted for in terms of an extension of the treatment of the definite description.

In terms of the referential use, the speaker may intend the FNQ to refer to the host noun when such an interpretation is available (and preferred). As discussed later in section 4.2.5, we will see further evidence for the possibility of the 'dual' status for FNQs (quantificational vs. referential), when we look at reference from a discourse point of view (in contrast to Kobuchi 2003, 2007, and Nakanishi 2004, 2007, 2008), in which the referential-like FNQ (as the NP-related FNQ) participates in the object-related quantifier construal.[63]

---

[61] Yoshimoto et al. (2006), for instance, maintain that the FNQ is provided a piece of discourse information (e.g., focus/non-focus) just like an independent NP, and that this may stand in an anaphoric relation to its host (Yoshimoto et al. 2006: 110).

[62] A related assumption consonant with the current analysis is that the restrictive vs. non-restrictive distinction corresponds to narrow focus on the quantifier vs. broad sentential focus (see, e.g., Peterson 1997; Göbbel 2004). For details in relation to Japanese FNQ constructions, see Yokota (2009, 2010).

[63] King (2001: Chapter 1) argues that demonstrative descriptions in English, which are very similar to definite descriptions, are quantificational NPs.

4.1.4 Partitivity

Japanese nouns are systematically ambiguous between a definite and an indefinite reading (aside from the singular/plural underspecification) (Kobuchi 2007: 114). This fact seems to be related to the fact that partitive/non-partitive readings are available depending on whether an FNQ is NP-related or VP-related. The standard predicate logic translations of the VP-related and NP-related FNQs that sentence (4.1) potentially generates would look like ((4.3) a) and ((4.3) b), respectively. ((4.3) a) expresses a partitive interpretation and ((4.3) b) a non-partitive (or exhaustive) one, though it is a little harder to obtain a sensible interpretation.

(4.3)

a. $\exists$ X[student'(X) $\wedge$ |X|=5 $\wedge$ lift.a.desk'(X)]

b. $\exists$ X[student'(X) $\wedge$ |X|=5 $\wedge$ $\forall$ y[student'(y)] $\rightarrow$ y$\subseteq$X $\wedge$ lift.a.desk(X)]]

A kind of linguistic trick that makes ((4.3) b) possible is using the quantifier *go-nin* 'five Cl' to refer back to a plural individual consisting of the set quantified over by the subject *gakusei* 'student'. Essentially, the interpretations in ((4.3) a, b) have the same logical meaning as 'there are students, who are five in number, and they lifted a desk'. The point here is that in the representation in ((4.3) b) the FNQ contributes to referential pronoun-like roles in the NP-related FNQ sentence, which are lexically encoded in the FNQ (see, e.g., ((4.1) a, c) and ((4.2) a, c) in the present analysis. For further discussion of this issue, see section 4.2.7.

The partitive interpretation is also linked to the definiteness of the nominal (see, e.g., Inoue 1978), as Watanabe (2008) points out. According to Inoue (1978), partitive quantification works on the definite expression. Hence, in the absence of further context, in the absence of a difference in syntactic configuration, and in the absence of intonational clues, we must conclude that

different readings for ((4.4) b) and (4.5) below can only be the result of a difference between the lexical content of the sentences (in combination with our world knowledge).

(4.4)

a. John wa *nidai no* **piano o** kai-tagatta.
   John Top 2-Cl Gen piano Acc buy-wanted
b. John wa **piano o** *ni-dai* kai-tagatta.
   'John wanted to buy two pianos.' (Watanabe 2008: 520)

Example ((4.4) a) involves a non-FNQ, and is ambiguous between the specific reading where John wanted to buy two particular pianos and the nonspecific reading where John wanted two pianos but did not care which ones (cf. Kamio 1977).[64] Unlike ((4.4) a), however, ((4.4) b) lacks the reading where John wanted to buy two particular pianos. If a semantic difference justifies positing a different structure, as suggested by Watanabe (2008), cases such as (4.4b) should be treated differently from cases like (4.5).

(4.5)

Narande hashitteita suu-dai no **torakku ga** *san-dai* gaadoreeru ni
in a row running several-Cl Gen truck Nom 3-Cl guardrail to
butsukatta.
hit
'Three of the several trucks that were driving in tandem hit the guardrail.'
(Inoue 1978)

In (4.5), Inoue claims, the property of the FNQ 'three vehicles' is that they 'hit

[64] *Specificity* is defined as referentiality (from speaker's point of view). Earlier accounts posit that the entity has to be previously established (see Enç 1991 for a comprehensive description), while more recent accounts claim that the entity has to be identifiable by both parties somewhere in the (previous, following, or general) discourse (see Ionin 2003; Roberts 2003, 2004, Abbott 2010 for relevant discussion).

the guardrail' (the property described by the predicate), and not that the three vehicles 'are several trucks which were running in tandem' (the property described by the host NP). To be more precise, three vehicles are only a proper subset of the several trucks that were running in tandem. The partitive reading is further ascertained due to the presence of the pronominal modifier *suudai no* 'several Gen'.

In light of the examples in ((4.4) b) and (4.5), the determination of partitive/non-partitive interpretation cannot be predicted completely by syntax alone, according to Inoue. Rather, as noted by Watanabe, the partitivity should be characterized in terms of specificity, which is often discussed from the semantic/pragmatic point of view (cf. Haig 1980). Watanabe concludes that this indicates that one has to distinguish those semantic aspects that are grammatically relevant from those that are not, and then the question remains whether these are directly encoded in the syntax or not. Although the distinction between partitive and non-partitive readings of FNQ constructions is sometimes a subtle issue, it should be dealt with in syntax together with the consideration of the relevant context.

4.2 Semantics of FNQ constructions

4.2.1 Overview

In section 4.1, we suggested that there are two different syntactic structures associated with two distinct interpretations. In this section, we argue that the FNQ functions as either an adverb or a referring expression. In so doing, we investigate the processes that characterize FNQ interpretations, focusing on the issue of distributive/non-distributive interpretation. The central question is whether or not the Japanese FNQ is always a distributive operator, as Gunji and Hasida (1998), Nakanishi (2004, 2007, 2008), and Kobuchi (2003, 2007) claim. Unlike these researchers, we argue that the interpretive ambiguity

can be resolved if the semantic ambiguity arises due to the existence of the two different types of FNQs (as quantificational determiners and as quantificational adverbs).

To represent the above idea, we introduce 'a tripartite structure for quantification' in the model-theoretical semantics (Heim 1982; Partee 1991; Herburger 2000), which partitions a sentence into three parts: quantifier, restriction, and nuclear scope, in this order. In an NP-related FNQ sentence, the subject noun restricts the domain of quantification, while in a VP-related FNQ sentence the verb constitutes the scope of quantification.[65] Importantly, this partitioning corresponds to Partee's (1991) correlation involving the relationship between the focus structure and the tripartite quantificational structure; background corresponds to restrictive clause and focus to nuclear scope (to be discussed in sections 4.2.2 and 4.2.3). This explains the observation that prosodic properties of the sentence affect the quantificational structure more or less independently of the syntactic structure of a given sentence.

4.2.2 D-quantification and A-quantification

In this subsection, it is shown how the interpretation of semantic relations is derived when the FNQ can be construed either within the nominal or the verbal domain. The core of this analysis is the notion that a given context restricts the domain of quantification (rather than the scope of quantification) and that in order to calculate the truth conditions of a quantificational expression, one always has to take into account the context

[65] Quantificational NPs are complicated in several ways. According to Heim (1982), the quantifier itself (supposedly expressed by the determiner of the NP) actually combines with two open sentences (i.e. the restriction and the scope), and it binds a variable in both of them. For instance, the format in ((i) b) is intended to reflect these relationships better (Abbott 2010: 42). See section 4.2.3 for related and extensive discussion.

(i) a. Every good boy deserves fudge.
b. every$_x$[good-boy(x)](deserves-fudge(x))

(including world knowledge).

In section 4.1, we looked at the structures of two types of Japanese FNQs. We now address semantic aspects relevant to FNQ quantification from the point of view that natural languages may adopt two kinds of quantification, namely D(eterminer)-quantification and A(dverbial)-quantification, as discussed in detail in Partee (1995, 2008) and other papers in Bach, et al. (1995).

Partee (1995, 2008) discusses a hypothesis concerning quantifiers in natural language. According to Partee, A-quantification is the quantification expressed by NP-internal elements such as determiners, while D-quantification is the quantification expressed by NP-external elements such as adverbs. This idea seems useful, and can be easily extended to the analysis of Japanese FNQs, leading to the assumption that languages like Japanese enjoy both D-quantification and A-quantification.

Let us take a look at the basic notions to be assumed in the discussion to follow. The study of quantification from the latter part of the twentieth century has tended to concentrate on generalized quantifiers (Barwise and Cooper 1981) which are taken to be the denotation of quantified NPs (see, e.g., Partee et al. 1990; Cann et al. 2009 for details). The basic idea behind the theory of generalized quantifiers is that quantifiers themselves relate two sets of entities in terms of shared membership of various sorts:

(4.6)

a. the set denoted by the restrictor (→ the NP denotation)

b. the set denoted by the main predicate (→ the VP denotation)

(Cann, Kempson and Gregoromichelaki 2009: 176-177)

We here would like to put forward the assumption that FNQ interpretations are characterizable as focus-affected interpretations (in a different sense from Takami (1998)), and the focus-affected interpretations can be modeled as a structured meaning, adopting the tripartite structure mentioned

earlier (see Heim 1982 and Partee 1991 for details), as illustrated in (4.7).[66] Some topics fall within the restrictive clause part of the tripartite structure, and others fall within the nuclear scope.

(4.7)

Sentence ⇔ Quantifier, Restrictor, Nuclear Scope

To interpret FNQ sentences properly, the lexical-semantic properties of FNQs also require that a legitimate quantificational structure and information structure be assigned. Because of this requirement, sentences containing FNQs must have a certain quantificational structure and information structure. The point to observe here is that quantificational structure as in (4.7) is very helpful for understanding the information structure as well as the sentence semantics (derived from the syntax) of FNQ expressions.

Partee (2008: 1) notes that every language appears to have ways of expressing quantification. Typically, quantificational notions are expressed in English both with NPs (broadly construed, covering current-day DPs and QPs) and adverbially, as in English examples (4.8) (taken from Partee 2008: 2-3).

(4.8)

a. *Every* student knows the answer. (*Most* students, *no* students, *three* students, *each* student, *many* students, *at least 10* students, ...)
b. A quadratic equation *always* has two solutions. (*Often*, *never*, *seldom*, *generally*, *typically*, *usually*, *almost always*, *in most cases*, ...)
c. *Usually*, if a dog barks, it doesn't bite.

Davidson (1967) originally proposed adding events to the ontology of individuals and representing simple event-sentences as involving existential

[66] We will see later in section 4.2.7 that the focus-induced interpretation is closely tied to a question-denotation: the focus is the answer to the question currently being addressed.

quantification over events; adverbs of quantification, as unselective quantifiers, may bind this event argument. A Davidsonian approach permits something like the following view (see also Langacker 1987; Partee 1991) on which the differences between D-quantification and A-quantification provide indirect evidence for the nature of systematic difference residing in the semantics of nouns and verbs.[67]

(4.9)

a. NPs denote or indefinitely describe entities.
b. Sentences denote or indefinitely describe events or situations.
c. Nouns express predicates of entities.
d. Verbs express predicates of events or situations.
e. D-quantification is quantification over entities.
f. A-quantification is quantification over events or situations.

Based on these considerations, a plausible assumption would be as follows: Japanese FNQs display both A-quantification ((4.9) f) and D-quantification ((4.9) e), and A-quantification is a more common means of quantification than D-quantification.

The ambiguity observed in NP-related FNQ examples, as given in (1.3) and (1.4) in Chapter 1, seems to illustrate a typical property of D-quantification that sets it apart from A-quantification. In the FNQ construction, separated from the host NP, since the VP is preferably interpreted as contributing to the scope of quantification, the quantificational force is likely to be much more in focus (as default) (see Takami 1998, 2001; Hatori 2002; Shimojo 2004; Yamamori 2006 for discussion on the relation between FNQs and focus). This can be accounted for in our account as follows: If quantification itself is at issue or in focus, as required by, say, the context, then the FNQ may assume an

[67] See, however, Partee (1992) for discussion on the non-rigidity and subjectivity of the distinction between entities and events.

adverbial nature (i.e., A-quantification) with relevant discourse markers including prosodic prominence (if necessary), or even without them, resulting in a VP-related FNQ reading.[68]

As Partee (2008: 7) states, compositionality issues that arise in the case of non-D-quantification (e.g., A-quantification) may include some challenging properties. The research issues related to FNQ constructions in Japanese to be addressed include the following:

(4.10)

a. Division of labor between syntactic structure and information structure (e.g., focus/non-focus articulation) in determining the interpretation of FNQs: How general are the relevant principles and do these two factors exhaustively determine the interpretation?
b. Concerning the interpretation of FNQs, their syntactic behavior sometimes seems incompatible with their classification as essentially quantificational (as defined in the traditional formal semantics).

In view of these research issues, it seems important to keep in mind that Japanese FNQs express D-quantification as well as A-quantification, so that we can deal with both NP-related and VP-related FNQ semantics in a compositional manner. This view (as an extension of Partee's D-/A-quantification and generalized quantifiers) is compatible with the assumption behind the tripartite quantificational structure in (4.7). We will elaborate on the way this formal semantic setup can be integrated into the present account below.

[68] This also correlates with the hypothesis that VPs, to the extent that they exist in languages, are the grammaticalization of focus structure (Van Valin 2005: 81).

4.2.3 Focus and quantification in the tripartite quantificational structure

The model of structured event quantification in (4.7) can be regarded as the semantic core of capturing what are called focus phenomena (see also Krifka 2006). The model enables us to see that the FNQ construction is made up of an NP for a restriction set and a quantifier applied to it. Extending this view, we argue on the basis of prosody that deaccenting (or accent weakening) is semantically tied to restrictive clauses, and accenting is tied to nuclear scopes. This line of analysis is confirmed by empirical evidence; for FNQ interpretation, there are intonational properties favoring that particular interpretation. This would mean that if grammar allows multiple interpretations for a given sentence, intonation may bias us toward one of them (Steedman 1996, 2000a, b, 2012).

Assuming a tripartite structure for quantification in the model-theoretic semantics (Heim 1982; Partee 1991; Herburger 2000) as in (4.7), we show possible semantic representations of (1.3), repeated here as (4.11), ascribed to the tripartite structure as in ((4.12) a-b), where the structured quantification substantially partitions the sentence into two parts; the domain of quantification [*R*], and scope of quantification [*S*], corresponding to non-focus (e.g. background) and focus, respectively.[69]

(4.11) (=(1.3))

Gakusei ga (//) *go-nin* tsukue o mochiageta.

student Nom five-Cl desk Acc lifted

(i) 'Five (of the) students lifted a desk (individually).' **[Distributive]**

(ii) 'Five students lifted a desk (together)' **[Non-distributive]**

[69] A relevant assumption is that the (anaphorically) deaccented phrase contributes to the domain of quantification of a quantifier rather than the scope of quantification (cf. Hendriks 2003). A constituent could be deaccented if its neighbour is accented and if it represents 'given' information, though determining when exactly information counts as given is not a simple matter (but see Schwarzschild 1999 for such an attempt).

(4.12)[70]

Q *R* *S*

a. $five_x$[student(x)](lift.a.desk(x)) ← VP is in scope (= (4.11) i)

= ∃e[∃X:*student'(X)](*lift.a.desk'(e) ∧ *Ag(e)=X ∧ |X|=5))

Q *R* *S*

b. $five_x$[lift.a.desk(x)](student(x)) ← NP is in scope (= (4.11) ii)

= ∃e[∃X:*student'(X) ∧ |X|=5](*lift.a.desk'(e) ∧ *Ag(e)=↑(X))

In the first line of ((4.12) a, b), the subscript *x* on *five* indicates which variable this quantifier binds. The square brackets enclose the restriction on the quantifier, and the parentheses surround the scope.[71] The difference (from the traditional logical analysis) is that the individuals considered for satisfaction of the main predication in the scope – *lift a desk*, in this example – are only those which satisfy the restriction. These can be thoroughly represented in the tripartite quantificational structure (in the second line of ((4.12) a, b)) in an event semantics mode (see section 4.2.8 for details). The operator '↑' is the group operator, contributing to generating non-distributive interpretations, and the operator '*' is the plural operator, freely applied in the nominal and in the verbal domain, and is responsible for distributive interpretations. (We will use these notations interchangeably in this study, and will also revert to traditional logical notation for purposes of explication.)

What we should note here is that there are certain cases where the NP-related FNQ structure is preferred, but it may be avoided in production (for some speakers) because it sounds, so to speak, 'over-correct'. Indeed, a plausible reason why the NP-related FNQ construction (in the unmarked

[70] As for the semantic formula in ((4.12) b), another possibility would be as follows:

∃ e[∃ X*Ag(e)=↑(X) ∧ |X|=5 ∧ *lift.a.desk'(e)] ∧ (Ag*(e)=student'↑(X))

This formula follows Herburger's (2000) semantics for focus, on which all the focal material is mapped into the scope of an existential quantification over events and the focus interpretation is obtained by the computation of all the focused material that does not appear in the restriction of this quantification.

[71] This notation, which also has the advantage of suppressing the logical connective, is sometimes referred to as the restricted quantifier notation (see Partee 1991, 1995 and Abbott 2010 for discussion).

context) is considered murky would be that the use of pronoun-like FNQs appears superfluous.

Even so, assuming that a characteristic function of NP-related FNQs is that they convey information that is generally already known to the listener, or information that is not necessarily informative to the listener in the discourse, we can define the NP-related FNQ as a quantifying-noun of a type <*noun, noun*>, and the VP-related FNQ as a quantifying-noun of a type <*vt, vt*>. Given these types, we expect that the FNQ is potentially construed with the associate NP appropriately (in a compositional manner). In this way, we can handle marked (or non-canonical) cases involving NP-related FNQs that create a pragmatically optimal but (at first sight) syntactically unlikely interpretation, rather than simply put such cases aside as exceptions.

We have already considered the possibility of the correct association between quantifiers, restriction, and scope in the restricted quantifier semantics (see (4.7)). Again, the point is that this information packaging corresponds to Partee's (1991, 1995) correlation in regard to the relation between focus structure and tripartite quantificational structure; background corresponds to restrictive clause and focus to nuclear scope. Partee (1991, 1995) points out focal materials tend to be interpreted as contributing to the scope of quantification. Hence, the VP is preferably interpreted as contributing to the scope of quantification, and, specifically, to the focus.

Turning to FNQ sentences in Japanese, assuming that both quantificational structures in ((4.12) a) and ((4.12) b) are in principle available for (4.11), the interpretive issue for FNQs can be reduced to the matter of focus-affected readings in the sense of Herburger (1997: 62). She claims that focus inside a DP can give rise to a focus-affected interpretation, where the focused predicate serves as the nuclear scope of the determiner and the non-focused part serves as the restriction (see also Krifka 2006 and Abbott 2010). The focused phrase gives rise to a set of alternatives. The rest of the sentence then yields the other set. In this way, FNQs establish a relation

between two sets.

Extending Partee's (1991, 1995, 2008) correlation in regard to the relation between focus structure and tripartite quantificational structure, we further contend that the (anaphorically) deaccented phrase (i.e. the absence of a sharp F0 rise) contributes to the domain of quantification of a quantifier rather than to the scope of quantification (Hendriks 2003: 11). Prosodic constraints such as DEACCENTING (as stated in (4.13) below) are closely related to Japanese FNQ interpretation, where deaccented phrases or constituents are required in order to contribute to the domain of quantification of an FNQ sentence.[72]

4.2.4 Accenting versus deaccenting

Given that FNQ interpretation is considered a focus-affected reading, our main concern at present is as follows: Which is involved in the identification of the focused expression with which an FNQ associates? In this subsection, we argue that in Japanese FNQ sentences deaccented material is interpreted as contributing to the domain of quantification of a quantifier (e.g., background) in the tripartite quantificational structure introduced in the previous subsection.

A good place to start is to examine English sentences containing the quantifier *most*, discussed by Hendriks (2003). Although determiners such as *most* are assumed to be focus-insensitive, emphatic stress can affect the interpretation of quantificational sentences involving these determiners (Hajičová et al. 1998). Effects of stress can be modeled by the following constraint which restricts the realization of information structure (from Hendriks 2003: 10):

[72] Many researchers derive stress syntactically and project foci domains from stress (see, e.g., Ladd 1980, 1996; Schwarzschild 1999). Furthermore, as argued by these researchers, contextually given elements show an effect of rejecting accent, but the anaphoric nature and/or the small content of functional elements will often allow them to be taken as given, in which case deaccenting results. The same thing can also apply to interesting issues relating to the correct account of the behavior of FNQs in Japanese.

(4.13)

DEACCENTING:

If a constituent is anaphorically deaccented, it must contribute to the domain of quantification of a quantifier.

This constraint on the realization of focused NPs is insensitive to other structural properties of the relevant constituent (e.g., whether the constituent is an NP or not, whether it appears preverbally or postverbally). The basic idea behind the deaccenting constraint is that an element can only be anaphorically deaccented if its sister is contrastively accented (cf. Williams 1997).[73] Thus, contrastively accenting *large* in the noun phrase *the large ships* gives rise to the anaphoric deaccenting of *ships*. Similarly, contrastively accenting *unload* in the verb phrase *unload at night* gives rise to the anaphoric deaccenting of *at night*. Note that being deaccented is not the same as not bearing any accent.

An element is deaccented if it is the sister of a contrastively accented element. If no contrastive accenting occurs, then deaccenting does not occur either. Note also that a default accent does not give rise to deaccenting. In cases where default sentential accent is indistinguishable from contrastive accent, we expect potential ambiguity, which can only be resolved by contextual information.

Hendriks argues that the constraint DEACCENTING in (4.13) predicts intonational patterns realized in quantificational sentences such as (4.14) and (4.15). The deaccented part of the VP helps restrict the domain of quantification.

(4.14)

Most ships unload AT NIGHT.

[73] This implies that accented constituents have to be interpreted as focus.

(4.15)
Most ships UNLOAD at night.

Indeed, this prediction is borne out by the interpretation of these sentences. Here, the sentence meanings differ with respect to whether the phrases *ships, unload* and *at night* contribute to the domain of quantification or to the scope of quantification.

Accented material, on the other hand, is predicted not to contribute to the domain of quantification if it occurs in a position where it should according to syntactic structure contribute to the scope of quantification, and vice versa. This prediction seems to be borne out by the following data containing *only* (cited from Hendriks 2003: 16-7):

(4.16)
Only ships unload AT NIGHT

(4.17)
Only ships UNLOAD at night

If *only* adjoins to the subject NP, the VP generally yields the domain of quantification. If a constituent in this VP is accented, as in (4.16) and (4.17), this accented element does not seem to be interpreted as contributing to the scope of quantification. That is, (4.16) does not seem to have the interpretation that only ships that do something at night unload. Similarly, (4.17) does not seem to have the interpretation that only ships that unload do so at night. Again, the interpretation deviates from the interpretation dictated by the syntactic structure of the sentence alone.[74]

Standardly, semantic relations such as the argument sets of a determiner

[74] We will consider the semantics of *only* in section 4.2.5.

are assumed to be based on syntactic structure (see Hendriks and de Hoop 2001; Hendriks 2003). In this view, the first argument set of a determiner, i.e. the domain of quantification, is supplied by its noun and possible modifiers of the noun. The predicate supplies the second argument set.

However, prosodic prominence can also be a factor in determining the two argument sets of a quantificational determiner.

(4.18)

a. Most ships unload AT NIGHT

b. Most people SLEEP at night

The preferred reading of ((4.18) a) under the assignment of stress as indicated is that most ships that unload do so at night. So the first argument set is given by the noun and the verb, whereas the second argument set is given by the adverbial phrase in focus. The preferred reading of ((4.18) b), on the other hand, is that what most people do at night is sleep. Here, the first argument set is given by the noun and the adverbial phrase, whereas the second argument set is given by the focused verb. In both examples, non-focal material yields the first argument set of the determiner, i.e., the domain of quantification or restrictor (*R*). Focal material yields the second argument set of the determiner, i.e., the scope of quantification or nuclear scope (*S*). If the stress patterns are reversed, we still find this effect:

(4.19)

a. Most ships UNLOAD at night

b. Most people sleep AT NIGHT

Here, the domains of quantification are given by the set of ships that do something at night and the set of people that sleep, respectively. That is, the non-focal part of the sentence gives us the first argument set of the determiner.

The focal parts of the sentence, *unload* and *at night,* give us the second argument set of the determiner. Next we will argue that this line of analysis can be applied to the analysis of FNQ constructions.

We will now consider deaccenting relevant to the FNQ construction. Informally speaking, if a listener wishes to interpret a sentence containing an FNQ, one of the things they must do is identify that focused expression. The analysis developed in what follows is based on a grammaticalized account of focus such as the one adopted in the structured meaning approach (Krifka 1991, 2006; Partee 1991; von Stechow 1991; Herburger 2000), which largely relegates focus to syntax and semantics.[75] Non-focused material forms a restriction on the quantifier, and the focused material constitutes its topic, which is compatible with the view discussed in the previous subsection.

Under the assumption that the restriction on a structured quantifier is background or presupposed/entailed and the scope is asserted (see (4.12)), the difference in information packaging follows directly from the assumption that since sentences containing an FNQ must have a certain quantificational structure and information structure, deaccented material is interpreted as contributing to the domain of quantification of a quantifier (e.g., background) (see Hendriks and de Hoop 2001, and Hendriks 2003 for further discussion).
One benefit within this account is that quantificational structure and information structure need not be specified as separate levels of semantic representation. Rather, they must be evoked by certain lexical items and specified in a single semantic representation of the syntactic structure.

The association between prosodic prominence and focus has been shown to hold in a variety of languages and is widely believed to be universal

[75] Degrammaticalized accounts of focus, including the alternative semantics approach of Rooth (1985, 1992) and the approach of von Fintel (1994), remove focus from the grammar and place it in pragmatics. Under a pragmatic approach, focus is assumed to signal the presence in the context of a certain kind of presupposition, to which some FNQs might be anaphorically or presuppositionally related (see also Mori and Yoshimoto 2002 for a discussion of the interaction between presupposition and certain types of floating quantifiers).

(Valluduví and Vilkuna 1998; Fretheim 2001; Gundel 1999, 2004; Van Valin 2005).[76,77] Focus interpretation can basically be induced by prosody as well as word order and morphology (see Jackendoff 1997, 2007; Rooth 1985, 1992; Erteschik-Shir 1997, 2007 for related discussion).

In terms of discourse-semantics, we will consider how the intonationally highlighted part, which is often associated with the most informative part, i.e., the focus, can be accommodated into the structured meaning (see section 4.2.3). The investigation of accenting and deaccenting is useful especially when we consider NP-related FNQs that often show general deaccenting phenomena such as downstep (or decreasing) effects (see Chapter 5 for more discussion).[78]

4.2.5 FNQs and conservativity

In this subsection, we suggest that focus of an FNQ is determined in the same manner as the argument sets of a quantificational determiner, as we have seen in the previous two subsections.

The FNQ in determiner position (i.e. NP-related FNQ) behaves like a determiner in that it lives on one of its argument sets, as traditionally defined. However, whereas other determiners rely on their first argument set (i.e., on the set introduced by the NP), the FNQ relies on its second argument set (i.e., on the set introduced by the VP). If this line of analysis is valid, then Japanese, like English, is a language in which true generalized quantifier NPs may exist. To better describe what we have in mind, we will first devote some space to the discussion of *only* in English, relying on de Mey's (1991) analysis.

[76] Prosodic prominence would always mean the presence of a pitch accent, with special prominence to the nuclear accent (see Kadmon 2001: Chapter 12 for an in-depth discussion).

[77] For various languages which use phonological means to convey information structure, see Halliday 1967; Jackendoff 1972, 1997; Lambrecht 1994; Ladd 1996.

[78] According to Ladd (1980: 183-4), deaccenting can happen for quite a variety of reasons, including definiteness, the fact that the reference of proper names is usually fixed in the context, the fact that certain things are already under discussion in the context, etc.

Interestingly, the behavior of *only* is quite comparable to that of the Japanese FNQ.

In English, the adverb *only* has a dual status. On the one hand, it is a determiner. At the same time, however, *only* has quantificational properties. Since *only* can appear in determiner position, one would expect *only* to display all properties displayed by quantificational determiners in general. For example, *only* is expected to display the formal property of conservativity (i.e., the 'live-on' property) (see Barwise and Cooper 1981; Partee, Meulen and Wall 1990):

(4.20)

Conservativity:

$DET_E(A)(B)$ iff $DET_E(A)(A \wedge B)$;

where DET_E represents the denotation of a quantifier, A the denotation of a common noun (the restrictor set) and B (the nuclear-scope set which is often a VP) is any subset of A, the universe of discourse.

This statement says that whenever the set B denoted by some nuclear-scope set is in the denotation of the generalized quantifier ($DET_E(A)$), NPs are analyzed as a set of sets of entities, and the set provided by the intersection of the sets denoted by the nuclear-scope expression and the restrictor expression ($A \wedge B$) is then also a member of the generalized quantifier.[79]

In assigning a truth value to a given quantified formula, conservativity says that all that must be done is to ascertain whether the entities that have the property indicated by the common noun bear the appropriate relation to the property expressed by the verb phrase. As the validity of the following equivalence shows, for instance, the determiner *all* is conservative:

[79] Conservativity also ensures that the interpretation of a quantified noun phrase containing a common noun N is not affected by those sets of entities that are not in the extension of N (see Montague 1973, and Barwise and Cooper 1981 for more discussions).

(4.21)

All cats purr ⇔ All cats are purring cats

It is held that all natural language determiners are assumed to be conservative. As Barwise and Cooper (1981) put it, determiners live on their first argument set. In contrast to other determiners, however, *only* in determiner position does not allow for the equivalence relation in (4.21):

(4.22)

Only cats purr ⇎ Only cats are purring cats

If it is true that only cats are purring cats, then it is not necessarily true that only cats purr. Because *only* does not appear to be conservative, it has been argued that *only* cannot be a determiner in (4.22). However, as de Mey (1991) points out, although *only* is not conservative at first sight, it does live on one of its argument sets, namely its second argument set. In short, de Mey applies conservativity to the verbal domain as well. He distinguishes between conservativity in the traditional sense, which he terms Right-conservativity, and the type of conservativity that is displayed by *only,* which he calls Left-conservativity.

(4.23)

Right-conservativity:

$DET_E(A)(B)$ iff $DET_E(A)(A \wedge B)$

(4.24)

Left-conservativity:

$DET_E(A)(B)$ iff $DET_E(A \wedge B)(B)$

Importantly, the following equivalence relation shows that *only* has the property of Left-conservativity and lives on its second argument:

(4.25)

Only cats purr ⇔ Only purring cats purr

So *only* in determiner position behaves like a determiner in that it lives on one of its argument sets. Yet, whereas other determiners live on their first argument set (i.e., on the set introduced by the N' in the above examples), *only* lives on its second argument set (i.e., on the set introduced by the VP in the above examples).

The same considerations in relation to English 'only' detailed above can be applied to Japanese FNQ sentences. Turning to FNQ constructions in Japanese, with the restricted quantificational structure (discussed in section 4.2.3), FNQs express a relation between two properties – the one expressed by the NP (or DP) with which they combine, and the one expressed by the predicate (VP) that the NP combines with to make a sentence. This implies that FNQ expressions have much to do with both Right-conservativity and Left-conservativity purely in semantic terms.

We posit that just like *only* in English, Japanese FNQs have a dual status. On the one hand, the FNQ is considered a focus adverb (which is responsible for A-quantification). At the same time, however, it has a quantificational determiner property (which is responsible for D-quantification).[80] Since the FNQ can appear in the determiner position (as an NP-related FNQ), we expect the FNQ to show all general properties displayed by quantificational determiners. Under this assumption, the FNQ displays the characteristic property of conservativity.

Let us first consider the case of Right-conservativity (4.23), assumed to

[80] As discussed in section 4.2.2, the position taken here is that both A-quantification and D-quantification can be observed in Japanese FNQ constructions. The former is related to the VP-related FNQ, whereas the latter is related to the NP-related FNQ.

apply to our NP-related FNQs. For expository reasons, we use the notion of conservativity and the property of living on an argument set to define the domain of quantification of a quantifier: The domain of quantification of a quantifier is the argument set (introduced by the NP) the quantifier lives on (see section 4.2.4). (4.26)(=Kuroda's (63)) is a realization of Right-conservativity in (4.23).[81] Note that ((4.26) a) is an object quantifier and logically synonymous with (4.29a) below.

(4.26)

a. **Gakusei ga** *san-nin* hataraite-iru. ⇔ (4.29a)
   student Nom 3-Cl work-Prog
   'Three students are working.'

b. **Gakusei ga** *san-nin* gakusei de hataraite-iru.
   student Nom 3-Cl student and work-Prog
   (Lit.)'Three students are students and working.'

The paraphrase in (4.26) tells us that the NP-related FNQ bearing Right-conservativity is computed in relation to common-noun extensions (i.e., restrictor). Turning to Left-conservativity, we follow Kuroda's (2008) discussion of determiners in characterizing that the definitions of conservative and intersective has some equivalence with existential constructional transform.[82] We will summarize Kuroda's (2008: 141-143) point relevant to

[81] Kuroda (2008: 131-2) assumes without argument that the floating determiner in a quantifier float sentence is an adverb adjoined to the verb phrase, and also disregards partitive readings in his arguments, though he admits that a number of delicate issues are involved with the grammatical phenomenon: the distinction between partitive and non-partitive readings, the distinction between distributive and non-distributive readings, and so on. However, as will be discussed below, in Kuroda's characterization Japanese FNQs employing (Right) conservativity should be considered NP-related FNQs (or quantified determiners) rather than VP-related FNQs (or quantified adverbs). Unlike Kuroda (2008), we assume that certain FNQs are adnominal (and non-partitive). With these, a plausible explanation is that Japanese FNQs can be identified either as adverbs with Left-conservativity, or as determiners with Right-conservativity (see (4.28)' and (4.34)'). We then maintain that both FNQ patterns are quantificational.

[82] According to Kuroda 2008, it is embodied in sentence structures of natural language,

the present discussion. Kuroda defines a determiner as a function that maps common nouns A to functions from the set of one-place predicates P to the truth values {0, 1}. Truth and falsity are denoted by 1 and 0, respectively:

(4.27) (Kuroda's (60))
D: A → (P → {0, 1}) (i.e., D is an entity of type <<e, t>, <<e, t>, t>>)

According to this definition, D(A)(P) takes the value 1 or 0, depending on whether it is true or false.

(4.28) (=(4.23))
Definition 1. A determiner is called *conservative* if it satisfies the following condition:
D(A)(P) = D(A)(A∩P) (cf. Barwise and Cooper 1981; Keenan 2002)

If we take into account the Left-conservativity in (4.24), we could modify (4.28) as follows:

(4.28)'
Definition 1. A determiner is called *conservative* if it satisfies the following condition:
D(A)(P) = D(A)(A∩P) or D(A)(P) = D(A∩P)(P)

According to Kuroda (2008), it can be empirically asserted that determiners of human languages are conservative. This can be illustrated by the following examples involving a non-FNQ, where the a-sentence is logically equivalent to the corresponding b-sentence:

---

by the 'there' transform in English, and by constructions with floating adverbial quantifiers in Japanese.

(4.29) (Kuroda's (63))

a. San-nin no gakusei ga hataraite-iru. ⇔ (4.26a)
   three Cl Gen student Nom working-are
   'Three students are working.'

b. San-nin no gakusei ga gakusei de hataraite-iru.
   three Cl Gen student Nom student and working-are
   (Lit.)'Three students are students and working.'

Kuroda, based on Keenan's (1987, 2002) theory, characterizes those determiners that can occupy the post-copula position of the *there* construction in English (weak determiners) as intersective (Keenan 1987, 2002). An intersective determiner is defined as follows:

(4.30) (Kuroda's (64))

Definition 2. A determiner D is *intersective* if it satisfies the following condition:

$D(A)(P) = D(A \cap P)(E)$.

For example '(exactly) three', is weak and intersective: (4.31) is grammatical and (4.32) and (4.33) are equivalent and show that 'three' satisfies (4.30).

(4.31) there are three students who are working

(4.32) three students are working

(4.33) three students who are working exist.

We can now easily confirm that the following proposition holds:

Proposition 1. Intersective determiners are conservative. (Kuroda 2008: 142)

For, if D is intersective we have the following equations:

(4.34) (Kuroda's (71))
$D(A)(A\cap P) = D(A\cap(A\cap P))(E) = D(A\cap P)(E) = D(A)(P)$

If we take into consideration the Left-conservativity in (4.24), we could rewrite (4.34) as follows:

(4.34)'
$D(A)(A\cap P) = D(A\cap(A\cap P))(E) = D(A\cap P)(E) = D(A)(P)$, and
$D(A\cap P)(P) = D((A\cap P)\cap P)(E) = D(A\cap P)(E) = D(A)(P)$

With these in mind, let us go on to the analysis of FNQ sentences ((4.35) a) and ((4.35) b), which have the same truth values. Based on the discussion by Kuroda (2008), we obtain the following equivalence relation, which shows that the (VP-related) FNQ can have the property of Left-conservativity (defined in (4.24)) and lives on its second argument (i.e. on the set introduced by the VP) with the existential transform, using an expression meaning 'exist' in the verbal predicate (as indicated in the translation of ((4.35)b)):

(4.35)

a. **Gakusei ga** *san-nin* hataraite-iru. ⇔
   student Nom 3-Cl working
   'Three students are working.'

b. **Gakusei ga** hataraite-iru no ga *san-nin* iru.
   student Nom working Nml Nom 3-Cl exist
   'Students are working: they are three in number.'

The equivalence in (4.35) illustrates the equivalence in (4.30) and shows that the determiner *san-nin* 'three persons' is intersective. We may take the

determiner *san-nin* 'three-Cl' in ((4.35) b) as a VP-adverb adjoined to the main verb *iru* 'exist'. The semantics of the sentence can be expressed by "(3)(gakusei ∩ hataraite-iru)(iru)", which is equivalent to the form in (4.30). From *Proposition 1* this has the same truth value as "(3)(gakusei)(hataraite-iru)". We can successfully use this property of the intersective determiner in identifying it with the Left-conservativity, as stated in (4.24), where the FNQ can be associated with VP extensions (i.e., nuclear scope). This idea seems to be promising, especially when we consider the fact that FNQs can function as (focus-inducing) adverbs (see section 3.1 (Chapter 3)). Another possibility is that we can identify the property of the intersective determiner with Right-conservativity by (4.34)'. In this manner, we can maintain that both of the two types of FNQs are defined as quantifiers. They contain either a quantificational determiner satisfying (4.23) (for NP-related FNQs) or a quantificational adverb meeting (4.24) (for VP-related FNQs).

We are now able to make use of this definition whose property of living on an argument set defines the domain of quantification of a quantifier: The domain of quantification of a quantifier is the argument set (either the nominal or verbal domain) the quantifier lives on. Consequently, in the NP-related FNQ construction conservativity is respected in the nominal domain (i.e. the first argument set), while in the VP-related FNQ construction it is respected in the verbal domain. Note, however, that context always restricts this domain of quantification (see, e.g., Partee 1991; Herburger 2000; Hendriks 2003; Krifka 1991, 2006). This indicates that in order to calculate the truth conditions of a quantificational expression (determiner or adverb), one always has to take into account a given context (see Chapter 5 for more discussion of this matter).

Thus far we have discussed the possibility of a semantic analysis of FNQs by relying on Right- and Left-conservativity proposed by de Mey (1991) based on the notions of conservativity and intersectivity (Kuroda 2008, and Keenan 1987, 2002). One advantage of taking this approach is that we can capture the semantic properties of the two types of FNQs in a principled

manner, whereby both NP-related and VP-related FNQs are thought of as quantificational expressions.

4.2.6 Existential individuation of *ga*

To consider fully the semantic properties of FNQ constructions, we will examine the functions of *ga*-marked subject nouns.

Existentiality is claimed to appear in one fundamental meaning of a *ga*-marked sentence (see Kuno 1973; Ishikawa 2008). Example (4.36) provides evidence for existential individuation with *-ga* (taken from Ishikawa 2008: 132). ('#' denotes a sentence that is unacceptable with the intended prosody.)

(4.36)

Otoko$_i$ **ga** /#wa *san-nin*$_i$ tachi-agatta.

guy(s) Nom/#Top three-Cl stood.up

'Three men stood up.' [*lit.* 'Men stood up by three.'] (Ishikawa 2008: 132)

The reason why the occurrence of *-wa* results in infelicity (without an additional accent on the subject) is not clear, and yet a clear contrast obtains with *-ga* in (4.36). In this FNQ example, the individuation indicated by the classifier *san-nin* 'three-Cl' is in accordance with the NP-*ga* phrase, while the parallel example with the NP-*wa* phrase is ruled out.

This seems to support the relevance of existential individuation to *-ga*. According to Ishikawa (2008), the ban on *-wa* in (4.36) is due to the division of the whole topic phrase into *otoko* 'man/men' and *san-nin* 'three persons' in information structure: A topic must stay in one topic structure unit. No part of the topic structure can be separated from the rest and contained in any other structural unit.

What is crucial to the present discussion is to notice that a *ga*-marked subject is not inherently focused, as shown in the following discourse.

(4.37)

A: Mary wa John yori se ga hikui-desu-ka.
Mary Top John than back Nom low-be-Q
'Is Mary shorter than John?'

B: Iie, Mary wa totemo se ga takai-desu-yo.
no, Mary Top very back Nom tall-be-Assert
'No, Mary is very tall.' (Heycock 1994: 165-6)

As Heycock convincingly argues, the focus is the predicate, i.e., 'low' or 'tall', and therefore the *-ga*-marked subject is not the focus. Nonetheless, the subject *se ga* is part of new information, *se ga takai* '(Mary) is very tall,' concerning the topic, *Mary*. Thus, *-ga* is not inherently a focus marker but instead introduces an existentially individuated entity, and marks it as a subject, which is newly presented as part of propositional content (see Takano 1992 for a similar claim).

Ladusaw (1994) claims that a thetic sentence (in the sense of Kuroda (1972)) simply affirms the existence of an eventuality and a property-denotation cannot be the basis of a thetic judgment. Kuroda (1972) contends that a thetic clause contains one conceptual unit and a categorical clause two distinct conceptual units. Interestingly, the thetic and categorical distinction is quite helpful to capture the prominence and phrasing in floating quantifier placement in examples including the one in (4.36) above. In the proposed analysis, in the VP-related FNQ rather than the NP-related FNQ, the quantifier may be positioned in order to allow the subject and the predicate to form a thetic pattern.

In light of these considerations, the NP-related FNQ construction as in (4.11) ii) (=((1.3) ii)) can be characterized as a signal allowing the subject and the FNQ to form a thetic subject-prominent pattern to express recognition of the existence of a situation. By contrast, the VP-related FNQ construction as in

(4.11) i) (=((1.3) i)) is conceived of as categorical in the sense that the first intonational phrase is topic and the second is a comment on it.[83] Thus, based on Kuroda's thetic/categorical judgments, we can say that the two types of Japanese FNQ constructions are informationally distinguished.

Let us turn to the intonational patterns of FNQ sentences. The subject [NP-*ga*] is often prosodically prominent as a result of focusing, which seems important in the discussion of NP-related FNQ patterns in terms of discourse information (or information flow). In a study by Mithun (2006), she claims that the cognitive integration of the two ideas is mirrored by prosodic integration. Her idea is quite similar to the thetic/categorical judgments discussed above. Interestingly, this assumption is consonant with our idea that while a VP-related FNQ is pronounced as two distinct prosodic phrases, each with its own terminal fall in pitch and a pause between, an NP-related FNQ is pronounced under a single overall prosodic contour. In this way, the two types of FNQ constructions in Japanese can be distinguished intonationally (see Chapter 5 for the distinctive contours).

One thing to note concerning the single prosodic contour is the following: If the subject is marked as nominative (without any prosodic addition such as emphasis or focusing), the subject is interpreted to be the topic by default (Kuno 1973, 1978). A topic normally constitutes an independent prosodic phrase when it is long and has one or more syntactic boundaries at its right end (see Selkirk and Tateishi 1991, and Shiobara 2004). However, when it is short, especially when it consists of only one word, it would not constitute a separate prosodic phrase, resulting in ambiguity when is observed in a string, for instance, *otoko ga roku-nin* 'six men' (see Downing 1970 for a similar view).

[83] Ikawa (1998: 332) claims that complements of perception verbs are considered thetic. It appears that the speaker verbalizes his or her perception of an event denoted by the predicate as one entire screen, an unanalyzed whole, in discourse (see also Ishikawa 2008 for relevant discussion).

4.2.7 Towards a proper treatment of NP-related FNQs

In this subsection, we take a closer look at the nature of NP-related FNQs about which there is still room for argument in the literature (see, e.g., Kobuchi 2003, 2007, and Nakanishi 2003, 2004, 2008). Our claim is that the assumption is valid that Japanese FNQs behave as either quantificational determiners (D-quantification) or quantificational adverbs (A-quantification) (as discussed in sections 4.2.2 and 4.2.5).

Previous syntactic (and semantic) accounts, reviewed in Chapter 3, need to be modified before they are able to incorporate data like (1.3) and (1.4) in Chapter 1, repeated here as (4.38) and (4.39), respectively.

(4.38) (=(1.3))

Gakusei ga (//) *go-nin* tsukue o mochiageta.

student Nom five-Cl desk Acc lifted

(i) 'Five (of the) students lifted a desk (individually).' **[Distributive]**

(ii) 'Five students lifted a desk (together)' **[Non-distributive]**

(Nakanishi 2007, 2008)

(4.39)

a. **Gakusei ga** kinoo *san-nin* // Peter o koroshita. (=(1.4b))

student Nom yesterday three-Cl Peter Acc killed

'Three students (as a group) killed Peter yesterday.'

(cf. Nakanishi 2007: 53)

b. **Otokonoko ga** kinoo *san-nin* isshoni booto o tsukut-ta.

boy Nom yesterday three-Cl together boat Acc make-Past

'Three boys made a toy boat together yesterday.'

(cf. Nakanishi 2007: 58)

The above data tell us that it is possible for the FNQ to have a non-distributive interpretation since the entities denoted by the FNQ are considered as an established group, though a distributive reading is also available for (4.38). In accounting for these interpretive effects, there seems not much to be obtained by viewing FNQs simply as VP-adverbs.

To gain a handle on the semantic variance observed in the FNQ construction, we suggest that the two distinct meanings of FNQs (distributive and non-distributive) can be compared to restrictive and non-restrictive modifiers. In particular, reevaluation of the NP-related FNQ from this perspective tells us that such an FNQ is primarily discourse-linked to its nominal status, rather than to its verbal status. In light of the assumption that an FNQ's occurrence in float position localizes its interpretation, the FNQ's association with the subject noun parallels that of a pronoun and its antecedent.[84] A simple (but plausible) explanation for this is that FNQs (especially NP-related FNQs) have almost the same status – as nominals. From this perspective, the FNQ phrase (i.e., the subject noun and its associated FNQ) is coreferential. In other words, they can refer to the same 'piece of reality' (Leech 1981: 12). The obvious candidate for such a seemingly non-quantificational interpretation is a kind of referring expression (e.g., anaphoric pronoun).

The core of the above contention is that a given FNQ is construed as something like a property expression in non-focus position (though it is still a quantifier), but is changed to a full-fledged quantifier in the focus position (unmarkedly, in the verbal domain). In the next two subsections, we will particularly characterize the NP-related FNQ interpretation as exhibiting the same semantic/pragmatic properties that are typical of pronouns or definite description, where the FNQ informationally represents non-focus (e.g., topic, background) rather than focus. It then comes as no surprise that we may

[84] Pronouns represent familiar referents. Pronouns are anaphorically related to something already in the discourse and therefore cannot convey new information (Erteschik-Shir 1997, 2007).

encounter the NP-related FNQ reading.

4.2.7.1 Analogy to restrictive and non-restrictive modifiers

Interestingly enough, in light of the differences between the uses of FNQ constructions, the NP-related FNQ is quite similar to a non-restrictive relative clause. In this subsection, we will discuss apparently unexpected parallels between FNQs and (non-)restrictive relatives in English.

It seems that listeners may interpret the ambiguous FNQ as a type of non-restrictive modifier. There are cases in which FNQs function much like restrictive relatives. We assume that FNQs are interpreted ambiguously between a restrictive and a non-restrictive interpretation. The aspect of this novel approach that is of immediate interest is apparent in an example like (4.40), which has both a restrictive and non-restrictive interpretation, and in (4.41), which has only the restrictive one:

(4.40)
Every unsuitable word was deleted.
a. Restrictive: Every word that was unsuitable was deleted.
b. Nonrestrictive: Every word was deleted; they were unsuitable.

(Larson and Marušič 2004: 272)

(4.41)
Every word unsuitable was deleted.
a. Restrictive: Every word that was unsuitable was deleted.
b. *Nonrestrictive: Every word was deleted; they were unsuitable.

(Larson and Marušič 2004: 272)

A generalization is that the concept of restrictive/ non-restrictive can be embodied in sentence structures of natural language by constructions with FNQs in Japanese. Here, let us take a different look at the situation, from the

point of view of a speaker/writer in the discourse (e.g., a sequence of utterances, or a text) who is intent on conveying information to an addressee.

The current analysis is to derive this striking parallel from a broader principle governing how non-restrictive interpretations are built up. This leads to the assumption that non-restrictive modification always involves reference, or at least some form of quantificational independence. In other words, the modified expression appears to behave as if it were property-denoting.

As mentioned earlier, in certain cases definite NP(-like) FNQs can also function as E-type pronouns (Evans 1980),[85] and they are only suitable if the prior discourse or lexical items have established something for them to denote. Before developing a concrete analysis of FNQs, we will briefly review the basic assumptions of Peterson's (1997) theory, using illustrative examples from English, in order to more fully clarify the assumption that FNQs may be analyzed as equivalent to English relatives.

Peterson's main claim is that in terms of prosody the restrictive vs. non-restrictive distinction largely corresponds to narrow focus on the quantifier vs. broad (or sentential) focus.[86] This claim allows us to consider that there is a parallelism between VP-related FNQs and restrictive relatives, and between NP-related FNQs and non-restrictive relatives.

Peterson compares the restrictive vs. non-restrictive readings of adverbs with the restrictive vs. non-restrictive readings of adjectives in sentences like (4.42), taking into account the relation between focus and prosody. On the restrictive reading ((4.42) a) a set of chairs is presupposed (non-focused), and it is asserted (focused) that the old one was sold. The non-restrictive reading ((4.42) b) amounts to a double assertion, namely, 'I sold the chair' and 'it was old'. (4.43) provides contexts for the two readings.

[85] According to Evans (1980), E-type pronouns refer to objects which satisfy the clause containing their antecedent – they are in effect equivalent to definite descriptions.

[86] The terms *broad* and *narrow* are often used in a relative sense. In this study, the term *broa*d is used solely to refer to cases of verb phrase or clausal focus, and focus on all other smaller constituents is referred to as *narrow* (Kahnemuyipour 2009: 127).

(4.42)

I sold the old chair.

a. I sold the chair which was old. (Restrictive)

b. I sold the chair, which was old. (Non-restrictive)

(4.43)

a. I sold the old chair. But I didn't sell any of the others, the new one, the one you hate, etc.

b. I sold the old chair. Now I have nothing to sit on.

Translating these facts into a focus-theoretical framework, the adjective is narrowly focused on the restrictive use and the whole NP (or DP) is focused on the non-restrictive use (i.e., the adjective is integrated into a broader focus; it may, but need not, be associated with a pitch accent).

(4.44)

a. I sold the [$_F$ OLD] chair. (Restrictive)

b. I [$_F$ sold [$_F$ the old CHAIR]]. (Non-restrictive)

Peterson further argues that the same distinction holds for adverbs in gerundive constructions. The sentences in (4.44) favor either the restrictive reading (a) or the non-restrictive reading (b).

(4.45)

a. The candle's burning brightly was seen by Harold.

b. The candle's burning brightly ignited the curtains.

In ((4.45) a) the NP subject refers to a complex event of the candle's burning being bright. In this case it is asserted about an event $e1$, namely the candle's

burning, that it is bright (*e*2 = *e*1 is bright). It is the brightness of the burning candle that was seen by Harold. In ((4.45) b), the NP subject does not refer to the same complex event; it refers to the candle burning itself. The whole sentence asserts two things, namely, that the burning ignited the curtains and that the burning was bright.

Peterson argues that the same two readings can be found with adverbs in sentential constructions and that different contexts can disambiguate the two interpretations. This can be seen in (4.46) and (4.47). Peterson crucially makes use of presupposition and assertion in describing examples of this kind.[87] On the restrictive reading in ((4.46) b), the event of the candle burning (*e*1) is presupposed to exist and it is referred to in the assertion (*e*2 = *e*1 is bright). ((4.47) b) does not involve a complex event, but simply asserts that the candle was burning and that the burning was bright. Hence it is not structured into a presupposition and an assertion.

(4.46)

a. How could you see any of the notes with only a candle to illuminate the music?

b. The candle burned brightly.

(4.47)

a. What caused the curtains to catch on fire?

b. Well, there are a number of possibilities. One of the smokers may have dropped a live ash on them. Or maybe Harold's chafing dish did it. The candle (on the windowsill) burned brightly (all evening). That may have done it. (Peterson 1997: 238-239)

It is clear from the discussion of the parallel adjectival cases such as (4.46) and

[87] The term *presupposition* is used here in the sense of Enç (1991), i.e., [+anaphoric] in the discourse.

(4.47) that what is at issue here is structuring the propositions into a focused part and a background or presuppositional part. The contextualized examples (4.46) and (4.47) only show that in English the 'restrictive' vs. 'non-restrictive' distinction corresponds to narrow focus on the adverb vs. broad sentential focus.[88] The two sentences can be given the focus-structural representations in (4.48) with pitch-accent notations (where uppercase letters indicate position of focal accent). In ((4.48) a), only the adverb is associated with a focal accent; candle is associated with a default peak accent because the focal accent comes late in the utterance. In ((4.48) b), the adverb is included into the broad focus projected by the internal argument. The adverb is associated with an L* pitch accent and set off in its own prosodic phrase. The H-H% boundary tones mark a continuation rise since the sentence is non-final in the text ((4.48) b).

(4.48)

a. The candle burned [$_F$ BRIGHTly].
H* L+H* L-L%

b. [$_F$ [$_F$ The CANdle burned] BRIGHTly].
L+H* L-L% L* H-H%

Having established that the restrictive/non-restrictive construals discussed by Peterson have to be identified with the occurrence of an adverb in focus (broad or narrow), we will now look at examples involving restrictive and non-restrictive uses of NP-related FNQs in Japanese, as exemplified in (4.49) below. Given the correspondence between a comma and a prosodic break on one hand and the distinction between the restrictive and the non-restrictive reading for a relative clause created by a differing prosodic pattern on the other,

[88] There is something inherently different between the default sentential stress and the focus stress rule. For instance, while focus stress is the phonetic realization of a syntactic property "focus", which also has semantic implications, default sentential stress is simply a formal property with no corresponding feature in the syntactic or semantic domains (Kahnemuyipour 2009: 129).

it is not hard to imagine that the intonational pattern in which a break occurs immediately after the FNQ can be used for the non-restrictive reading. In (4.49), words in capitals indicate prosodic highlighting (normally marked by raised pitch), which are regarded as focus (i.e., most informative).

(4.49)

a. **Non-restrictive use:**

[GAKUSEI ga *naná-nin*] // hón o yónda(-yo).

student Nom seven-Cl book Acc read

'Seven students read a book/books.'

b. **Restrictive use:**

[Gakusei ga // *NANÁ-nin* hón o yónda(-yo)].

student Nom seven-Cl book Acc read

'Seven (of the) students read a book/books.'

Since, as we have seen above, the restrictive modifier of a noun has a function of restricting the set of a noun to the subset that has a certain property X (here *reading a book/books*), this presupposes that there are other members (here *students*) in that noun set that do not have that property X. This would mean that for ((4.49) b), there will be other students that do not read a book/books. On the other hand, the non-restrictive relative clause in ((4.49) a) simply provides further information about the preceding noun *gakusei* 'student'.

Both sentences in (4.49) are instances of narrow focus. ((4.50) a) and ((4.50) b) provide probable contextual questions asking for ((4.49) a) and ((4.49) b), respectively.

(4.50)

a. Who read a book?

b. How many students read a book?

When we have a pragmatic context suitable for asking a question of this sort the intended interpretation becomes more readily available, as we see with the example in (4.49). For example, the *Wh*-question ((4.50) a) (*Who read a book?*) introduces an open proposition (Prince 1986), or topic of conversation, corresponding once again to the concept of *a person who read a book*. It is thus the presence of the open proposition rather than some other that makes the intonation contour in ((4.49) a) felicitous.

Generally speaking, when a piece of information new to the listener is introduced in the discourse, it does not constitute a topic. It is more likely to be something the speaker wants to call to the addressee's attention than something that is already in the focus of attention (Lambrecht 1994: 126). More specifically, in ((4.49) a) the subject NP is narrowly focused on the non-restrictive reading, whereas in ((4.49) b) the FNQ is narrowly focused on the restrictive reading.

Under the non-restrictive reading in ((4.49) a), it is asserted about an individual, namely *students* reading a book, and the FNQ, which is defocalized, is neither topic nor focus, but background (or completive) information (see Butt and King 2000 for details of information-structure roles). On the other hand, the restrictive reading in ((4.49) b) does not involve a complex individual, but simply asserts that the number of students was seven (not five, six, ...).

From the discussion above, we can say that sentences like (4.49) in the 'written' mode are compelling examples of the role of prosody in focus/non-focus interpretation. The interpretation and acceptability should be accounted for in the light of focus/non-focus information. Non-restrictive readings generally involve non-focused modifiers and restrictive ones involve focused readings (see Peterson 1997 and Göbbel 2004). In Peterson's account, non-restrictive modifiers are in some sense secondary or additional (but not always redundant) extra comments on the current utterance that happen to be interleaved with it, resulting in a co-reference relation. On the other hand, a restrictive modifier is focalized and non-anaphoric.

We will further discuss and set up a framework for elucidating FNQ effects that explains syntactic limitations displayed in virtue of the ongoing process of building up an interpretation.

4.2.7.2 Parallelism between pronouns and NP-related FNQs

From a processing perspective, contextual factors associated with noun phrase interpretation may not result from just a connection to the pragmatic context of utterance, but may be an essential part of the meaning of a particular expression in relation to a particular context (see, e.g., Kempson et al. 2001, 2004, 2006). We will devote some space to discussion in support of the view that the subject-oriented FNQ in Japanese may be considered such a case.

To capture characteristic properties of NP-related FNQs, we will argue that in the processing of FNQ constructions, an FNQ string (the subject NP and the associated FNQ) independently makes its contribution to sentence meaning, without stipulation of a construction specific device (e.g., movement motivated by non-syntactic factors), or providing (unnecessary) complications for the semantics like the one proposed by Kobuchi (2003).

Significantly, an NP-related FNQ can be viewed as an NP in the present analysis. This assumption seems feasible if we understand the FNQ in terms of a group denotation such as pronouns or definite descriptions. These two categories are generally considered to belong to a super-category of definite NPs (Abbott 2010: 209). Intuitively and pre-theoretically speaking, both of the NP types are commonly used by a speaker to direct an addressee's attention to some particular entity (including a plural sum entity) that the speaker wishes to talk about.

The similarity between NP-related FNQs and pronouns is further apparent upon closer inspection of FNQ sentences like (4.38)(=(1.3)), repeated again in (4.51).

(4.51)

Gakusei ga *san-nin* sono hon o katta.

student Nom three-Cl that book Acc bought

(a) 'Three of the students bought that book.' (Partitive)

(b) 'The three, the students, have bought the book.' (Non-partitive)

For the [Subject NP, FNQ] fragment, the two different readings are compared to the different uses of indefinite NP construal. As has been traditionally assumed, NPs are ambiguous between their quantificational and referential(-like) uses (see Fodor and Sag 1982; Abbott 2010, and references therein).[89] With respect to the latter use, when we utter a phrase like *gakusei ga san-nin* 'students Nom 3-Cl' as in (4.51), we are speaking about a set of three students (not, say, seven) and we refer to them as a plural specific/referential set.

Sentence ((4.51) a) yields a partitive reading, as indicated by the English gloss. In contrast, ((4.51) b) has a reading in which the NP is an additional description using a referential FNQ, which might either be used referentially and refer to the same individual its antecedent refers to, or may be used descriptively, i.e., as a substitute for its antecedent. The point here is that the FNQ in examples like ((4.51) b) is presumably used as anaphoric pronoun-like. In the NP-related FNQ pattern, the FNQ seems strictly anaphoric, and hence the pattern is only special in that the antecedent for the anaphor is introduced within the same clause.

The above idea needs to be examined in one further respect. We suggest that the presence of NP-related FNQs contributes to definiteness. It seems natural to consider an NP-related FNQ to be on a par with a definite

[89] Fodor and Sag (1982) present several tests that can be applied to identify the referential use of indefinites: (i) an indefinite modified by a relative clause, (ii) an indefinite modified by *a certain*, *specific* or *particular*, (iii) an indefinite headed by referential *this*, (iv) wide scope over other operators. See Heim (1991), Ionin (2003) and Abbott (2010) for further discussion of the problems that may be faced by the referential-quantificational ambiguity analysis.

determiner: that is, it is a sort of maximality operator, which entails that the quantifier takes the maximal member of the (given) set (see Giannakidou 2004 and Abbott 2010 for further discussion of quantification and maximality).[90]

Definiteness appears to be closely related to referentiality, and indeed definiteness and referentiality are often taken to be essentially the same thing (Abbott 2010: 209-210). We should note that it is not just pronouns that can be used anaphorically. Interestingly, definite noun phrases can in certain cases operate in the same manner.[91] An apparent problem with the above assumption is that definiteness is often associated with referentiality, since referentiality has traditionally been regarded as inconsistent with quantification (Abbott 2010: 213).

Determining whether definite descriptions are referential or quantificational is not a straightforward task (Fodor and Sag 1982). Yet, what seems most important is to show that FNQs, particularly NP-related ones, function as definite descriptions requiring there to be something that they identify in the discourse that is already salient or is not informative, (though not always anaphoric in the same way as true pronouns). In the case of NP-related FNQs, the FNQ is understood anaphorically as denoting, for instance, *san-nin* 'three people', which has been introduced into the context already and is uninformative. Hence, the availability of NP-related readings involving FNQs, which are not accounted for under the traditional FNQs-as-adverbs analysis, has led us to pursue an alternative analysis.[92]

---

[90] On a semantic account, the NP-related FNQ, could play the role of the type-shifter *iota* "ι" (rather than *lambda* "λ") when a definite/referential reading is needed in the non-distributive FNQ sentence (e.g. (4.38), (4.39)). Another possibility is that in addition to contextual domain restrictions, the rough interpretations introduce a maximal sum (or supremum) operator that loosely corresponds to the definite determiner in the paraphrases (see Link 1983 and Landman 2000 for discussion).

[91] Abbott (2010: 213) provides examples like the following:
(i) John$_i$ shouted at Mary$_j$ again. The fools$_{i+j}$ just won't accept that their marriage is over.

[92] We might say that in NP-related FNQ constructions the associated NP behaves like an "elliptical" NP in that it anaphorically picks up the property referred to (or introduced) by the FNQ (see Shimojo 2004 and Kiaer 2005 for similar claims).

4.2.7.3 Parallelism between E-type pronouns and NP-related FNQs

The distinct semantic status of NP-related FNQs needs to be further investigated. In this subsection, We will argue that a striking difference in interpretation is in fact caused by the different quantificational status of FNQs: VP-related FNQs are quantificational, while NP-related FNQs are referential(-like), and coreferent with the subject (intentionally or only accidentally). If such is the case, only the NP-related FNQ must be dependent on an antecedent in the sense that it refers to an exhaustive group of individuals (hence creating a non-partitive reading).

Importantly, the above difference is reflected in intonational realizations (see section 5.3 (Chapter 5)). In some cases, an FNQ is grouped prosodically with the preceding host NP rather than the following VP and interpreted as an NP-related FNQ. This special pattern is used to manipulate the flow of information in speech.[93]

Let us consider further the function of the NP-related FNQ. It may help to momentarily revisit the analytical intuition that FNQ meaning involves, in some sense, interleaving two utterances, one commenting on or elaborating the other. Specifically, ((4.39) a)(=((1.4) b)), repeated as (4.52), can be paraphrased by sentences involving definite description construal as indicated in the English translation of (4.53):

(4.52)

Kodomo ga	kinoo	*san-nin* //	inu o	koroshita.	=((1.4) b)
children Nom	yesterday	3-Cl	dog Acc	killed	

'Three (and only three) children killed the dog.' (Nakanishi 2004, 2007)

[93] The notion of information flow is extensively discussed in Chafe (1987), Kuno (1976, 1978, 1987), Prince (1986), Du Bois (1987), Givón (1988), among others. The speaker in conversations keenly attends to the hearer's current knowledge about a topic which is about to be discussed or under discussion, and selects appropriate forms (lexical, syntactic, and phonological) for it.

(4.53)

Kodomo ga kinoo inu o koroshita. *San-nin* (ga) soo-shi-ta(yo).
children Nom yesterday dog Acc killed three Nom do.so-Past
'(Intended meaning) Children killed a dog yesterday. Three of them did so.'

What is special about (4.52) is that it is a way of saying both sentences in (4.53) at once. Presumably, the semantic content of (4.52) and that of (4.53) are the same: 'There are children, who are three in number, and they killed the dog yesterday.' The FNQ, *san-nin* 'three (persons)' refers back to a plural individual consisting of the set quantified over by the subject *gakusei*. What the non-restrictive modifier (here *san-nin*) modifies is a potentially plural discourse referent such as the one the pronoun in (4.53) refers to.

Why is this special type of anaphoric *san-nin* possible in (4.52)? A possible explanation is that the FNQ may function roughly as if it were an E-type pronoun; that is, the special noun is interpreted in the same way as a definite description (Heim 1990). Given this, the above paraphrase in (4.53) introduces a maximum operator by definition, which corresponds to the definite determiner (see Giannakidou 2004; Abbott 2010 and references therein for details). When it comes to the interpretation of some FNQs as E-type pronouns, we need a distinct approach to interpreting these FNQ sentences. This approach would require taking into account, in addition to truth-conditional content, the (direct or indirect) impact of the context in which processing of discourse occurs, rather than simply providing interpretations for isolated sentences as in previous studies.

As discussed in section 4.2.7.1, a non-restrictive referential modifier is in some sense a secondary, additional or extra comment on the current utterance that happens to be interleaved with the preceding clause or phrase. The FNQ in (4.51b) and (4.52a) is presumably used as pronoun(-like), and

appears to be anaphoric to a property-denoting NP (i.e., host noun). It seems reasonable to consider the NP-related FNQ to be special in the sense that the antecedent for this 'anaphor' (here FNQ) is introduced within the same clause, and is identical to a contextually restricted definite description.

To sum up, first we have seen that VP-related FNQs and NP-related FNQs are parallel to restrictive and non-restrictive interpretations, respectively. An important finding is that non-restrictive readings largely involve non-focused FNQs (when the subject is focused) while restrictive readings involve focused FNQs (when the subject is not focused).

Second, we have seen that a striking interpretive difference is caused by the distinct semantic status of FNQs: the VP-related FNQ can be considered a quantifier, while the NP-related FNQ can be considered referential and co-referential with the subject (intentionally or only accidentally). If such is the case, only the NP-related FNQ must be dependent on an antecedent referring to an exhaustive group of individuals (i.e., on maximality).

Third, we have seen that the NP-related FNQ receives an interpretation that (loosely) reflects E-type anaphora (Heim 1990). Consequently, the E-type pronoun approach to FNQs seems to hold more promise if an FNQ sentence can be analyzed as a single unit underlyingly containing two propositions (or clauses) (see (4.53)).

Given the correspondence between an FNQ and something resembling an E-type pronoun on one hand and the distinction between the restrictive and the non-restrictive reading for a relative clause created by a differing prosodic pattern on the other, it is plausible that an NP-related FNQ sentence might be used for the non-partitive reading, thus generating non-distributive readings (see the next section 4.2.8 for details). If so, it is reasonable to assume that there are two different prosodic structures appropriate for two distinct meanings, expected to show no sign of difficulty for either prosodic condition (see sections 5.3 and 5.4 (Chapter 5)). Next, we will turn to the issue regarding the lexical-semantic analysis of FNQ sentences, mainly referring to work of

Kobuchi (2003, 2007) and Nakanishi's (2004, 2007, 2008).

4.2.8 Atomicity and distributivity

We will have little new to offer in the way of lexical semantic analysis and will largely rely on what other representative researchers including Kobuchi (2003, 2007) and Nakanishi (2004, 2007, 2008) have contributed mainly in formal semantics, and, in particular, on ideas suggested by these researchers which are easily incorporated into the current analysis of FNQ interpretation.

On the basis of existing studies mentioned above, we first summarize the principal features of lexical-semantic analyses of Japanese FNQs, and then discuss the issue of what to do about the relation between plurality and FNQ interpretation. This will shed light on the fundamental question as to what the contribution of the semantics of the FNQ really is.

First of all, it is necessary to keep in mind that information from the lexicon is in general subject to pragmatic enrichment (e.g., focal prominence) (see Lambrecht 1994; Steedman 2000a, b, 2012; Kempson et al. 2001, 2004, 2006, among others), and that the event semantic representation of the FNQ construction is ultimately determined in the context. A consequence of this assumption is that the FNQ does not necessarily contribute to distributivity. Rather, a distributive reading is more often than not a result of interpreting an FNQ compositionally within the verbal domain (i.e., unmarkedly, as a focused part of the sentence), together with the requirement that the classifier have the function of individuation (Kobuchi 2003, 2007). This function is compatible with the *ga*-marked host noun, which denotes existential individuation in the discourse (see Kuno 1973; Ishikawa 2008, and see section 4.2.6). Putting these assumptions together suggests the possibility of structural and contextual contribution to the semantic content of the FNQ construction. However, it seems that things are a bit more complicated than this.

We will begin by considering Link's and Landman's event semantics. Relying on their semantics, we then postulate lexical representations that are suitable for analyzing semantic differences and are also consistent with the structured quantification considered to be a necessary condition for the felicitous interpretation of FNQ sentences (see section 4.2.3.)

4.2.8.1 Distributive operators and event semantics[94]

A complicating factor in lexical semantics is the fact that nouns in general are potentially plural, which brings issues in regard to group vs. distributive interpretation into the picture (see Link 1983, 1984; Landman 1989, 1996, 2000; Chierchia 1998a, among others).[95] In a series of papers, Link develops a theory of plurality of which the most important characteristic is the assumption that the semantic distinction between singular and plural noun phrases is not a distinction between concrete individuals and abstract sets but between concrete singular and concrete plural individuals.

Link's theory of plurality identifies certain entities as being 'part of' other entities, technically known as *mereology* (see Partee et al. 1990 for details). For the sake of clarity, let us consider a simple model containing just three elements, *a*, *b*, and *c* and a connective $\oplus$ which connects 'atomic' elements (elements which cannot be further subdivided) to provide their individual 'sums' (i.e., i-sums). Sums are complex entities formed by combining entities and are defined by a particular kind of part-whole relation. All the elements (*a*, *b*, *c*, $a \oplus b$, $a \oplus c$, $c \oplus b$, $a \oplus b \oplus c$) are then of denotation type *e*, i.e., entities. Groups are thus defined as i-sums and have the same status as single individual entities except that the latter, being atomic, have no further

[94] The descriptions in the next two subsections are largely based on the description in the semantics textbook by Cann, Kempson and Gregoromichelaki (2009: Chapter 3).

[95] Schwarzschild (1992, 1996) provides a semantic analysis without having to resort to lattices and opposes the lattice-theoretic approach of Link (1983, 1984) and Landman (1989), which he claims has a so-called 'denotation problem', and instead proposes a set theory. See Mizuguchi (2004) for a critical review on Schwarzschild's focus theory.

parts of the same sort (although, of course, they might have parts of a different sort). A sum of a number of entities is similar to the set containing them, in that sums are completely defined by their members just as sets are. The main difference is that whereas sets are abstract, sums are as concrete as their constituents (Cann, Kempson and Gregoromichelaki 2009: 129-130).

With the semantics described above, Nakanishi (2004, 2007, 2008) develops a semantic analysis that does not employ the D(istributive)-operator, which has been used to explain the characteristic reading of quantifier float (Link 1983, 1984). Nakanishi's theory is instead based on Landman's (1989a, 1989b, 1996, 2000) plurality theory which reduces distributivity to semantic plurality, eliminating the D-operator; unless a sum is (re)analyzed as a group (or associated with a group operator), it yields, by default, a distributive interpretation. It is true that this is a significant simplification of the theory, and may certainly be a merit of the present analysis as well, but that is not the only way to explain distributivity. We will shortly see that the traditional theory using D-operators, which is theory-neutral, can in fact capture the facts for FNQ sentences.

It is important to notice that we can treat things and groups of things as entities of the same kind; both are represented by sets of individuals. (In the case of an individual thing, this is a set with one element.) Because of the use of meaning postulates (see, e.g., ((4.63) a-d) below), the present theory can treat collective verbs like *gather, surround* and distributive verbs like *walk, laugh* in exactly the same way at the syntactic level. The difference between distributivity and collectivity only shows in the semantics. We must look more carefully into this point. Some predicates are considered inherently group denoting. Thus, a verb like *laugh* inherently denotes a set of entities and its group denotation is the set of all i-sums of the individuals in this set, as shown in ((4.55) a, b) (cf. Landman 1989a, b, 2000). However, a verb like *gather* lexically denotes a set of i-sums and no atoms, i.e., the set of all groups (or individual sums) of entities that gather where each group has more than one

member, as in ((4.55) c). (*'M'* stands for the model in model-theoretic semantics, which largely corresponds to the domain of discourse, in which some formula is evaluated as either true or false.)

(4.55)

a. $||\text{Laugh'}||^M = \{a, b, c\}$

b. $||\text{*Laugh'}||^M = \{a, b, c, a \oplus b, b \oplus c, a \oplus c, a \oplus b \oplus c\}$

c. $||\text{Gather}||^M = \{a \oplus b, c \oplus d \oplus e\}$

(Cann, Kempson, Gregoromichelaki 2009: 131)

The generalization obtained from the above observation would look like (4.56).

(4.56)

A distributive predicate is one whose denotation contains only atoms:

$\text{Distr'}(P) \Leftrightarrow \forall x[P(x) \rightarrow \text{At'}(x)]$

(Cann, Kempson, Gregoromichelaki 2009: 130)

For a distributive predicate *P*, the associated group predicate is represented as **P* which denotes the set of all the individual sums of atomic individuals in *P* (including the atoms themselves). A predicate *P* is collective just in case no element in the denotation of *P* is atomic:

(4.57)

$\text{Coll'}(p) \Leftrightarrow \forall x[P(x) \rightarrow \neg \text{At'}(x)]$

We here address predicate denotation in terms of group. A distinction is traditionally made between distributive predicates, where the property expressed by the predicate holds of each element denoted by a plural expression (4.58), and collective predicates, where the expressed property holds only for a whole group (4.59). Some predicates are ambiguous between

distributive and collective readings (4.60). (All examples are taken from Cann, Kempson and Gregoromichelaki (2009: 129-130). The symbol "⊢" is read as "therefore".)

(4.58)

a. John and Mary were singing. ⊢ John was singing.

b. Some students were drunk. ⊢ A student was drunk.

(4.59)

a. John and Mary met yesterday. ⊬ ?Mary met yesterday.

b. Some students gathered at the door. ⊬ ?A student gathered at the door.

(4.60)

a. Three students lifted a table (together). ⊬ A student lifted a table.

b. Three students (each) lifted a table. ⊢ A student lifted a table.

What makes plural NPs interesting is that they can combine with predicates in different ways. The semantics of the verbal predicate determines whether a sentence can be interpreted distributively or not, which may be a potential complication involved in the semantics of individual words. The meaning for a word must provide the basis for different types of interpretation, and can determine complex entailments. Ambiguous expressions are disambiguated at the level of representation allowing the interpretation procedure to carry out its work straightforwardly.

4.2.8.2 Landman's event semantics

We will follow Landman's (1989a, 1989b, 1996, 2000) event semantics, which basically follows Link's lattice-theoretic approach, but Landman argues for the notion of 'groups', which is different from Link's 'sums'. Landman

assumes that predicates can have a 'group predicate reading' whereby the predicate denotes not only the set of atomic individuals that have a certain property but also the individual sums of all those atomic parts that form the denotation of the individual predicate. The distinction between sums and groups now directly corresponds to the distinction between the distributive and the collective reading. For purely distributive predicates like *sing*, all we need to assume is that one can derive a group denotation from the simple set denotation by using the plural operator '*'.

On the above hypothesis, it is possible to derive a group denotation from the simple set denotation. Landman (1989a, 1989b, 1996, 2000) uses '*' to make predicates always distributive, and admits no necessity to assume Link's distributive *D*-operator. He claims that the work of the *D*-operator is completely taken over by '*'. In Landman's framework, the distributive properties are always applied to sums and the collective properties are applied to groups only. As for a collective reading, it is assumed to be the result of a predicate applying to a collection of individuals as a group. Technically, a group is formed by applying a group-forming operator '↑' to a sum of individuals, as in $\uparrow(x \cup_I y \cup_I z)$ (see also Nakanishi 2004, 2007).

For Landman, a plural denotation can be derived from a singular predicate denotation by freely applying the plural operator '*', which is basically the same as Link's pluralization operation, both in the nominal and in the verbal domain. Landman calls Link's impure atoms 'groups', which enter interpretations through NP interpretations and quantifiers. Landman takes plural NPs to be ambiguous between a group interpretation and an i-sum interpretation. VPs are then taken to basically denote group objects (i.e. sets of sets of entities of any cardinality) and utilize a distributive operator '*D*' taking scope over the VP to assign a distributive reading. Here again, the lexical semantics of the predicate determines whether the use of the distributive operator makes any sense. For instance, since *gather* will have no atoms in its denotations (as required by its lexical meaning) (see ((4.55) c)), the

distributive operators will always yield the null set (and generate a meaning that does not make sense).

This is why *Four(Student'$_{pl}$)^{D}(Gather')* will always be false: ^{D}*(Gather')* will always denote the null set. Where there is more than one quantified NP in a sentence, the number of ambiguities increases according to the scope of the distributive operator. We will not, however, go any further into these matters (see Gunji and Hasida 1998; Mizuguchi 2004; Kobuchi 2003, 2007; Nakanishi 2004, 2007 for further discussion).

Link assumes that VPs basically denote group objects (i.e., sets of sets of entities of any cardinality). For the sake of clarity, let us consider possible representations of the content of *Four students lifted the table* in (4.61), which is interpreted as depicting as many as four acts of lifting (each individual lifted the table separately).

(4.61)

a. *Four*'(*Student*'$_{pl}$)(**Lift*'(*The*'(*Table*')))

(Possibly) Non-distributive: Some set of sets of entities that lifted the table either individually or collectively.

b. *Four*'(*Student*'$_{pl}$)^{D}(**Lift*'(*The*'(*Table*')))

Distributive: Some set of entities based on $[\![$*(*Lift*'(*The*'(*Table*')))$]\!]^{M}$ who lifted the table individually.

(Cann, Kempson, Gregoromichelaki 2009: 132)

As indicated, the distributive operator simply picks out all atomic i-parts of an argument and asserts the predicate to be true of these:

(4.62)

$^{D}*P \Leftrightarrow \lambda x \forall u[\text{A-part}(u,x) \rightarrow \text{P}(u)]$

(Cann, Kempson, Gregoromichelaki 2009: 132)

What this says is that ${}^{D}*P$ denotes a set of group individuals such that if x is a member of $*P$, then all its individual parts are members of the set denoted by the atomic predicate P. Given the semantics delineated above, the syntactic structures will be mapped to tripartite quantificational structures appropriately.

4.2.8.3 Lexical-semantic representations of FNQs

This subsection discusses semantic representations that fit well with the grammar allowing distributive as well as non-distributive readings. It is instructive to begin our discussion with Japanese common nouns (which differ greatly from English common nouns).

As Takano (1992) claims, Japanese common nouns are indefinite NPs, which do not introduce an existential presupposition by nature. This assumption seems to indicate that in FNQ sentences a common noun (subject NP) is not always recognizable as the domain of quantification provided by the FNQ. Rather, there are cases where the host NP is focused (in the right context) and contributes to the scope of quantification (generating an NP-related FNQ reading), which is in fact the core of the claim made in section 4.2.7. This subsection elaborates on this claim.

It is widely held that there is no grammatical distinction between singular and plural nouns in Japanese (Kuno 1973, 1978; Takano 1992; Ishikawa 2008, among many others). For example, for both one apple and two apples, *ringo* 'apple' suffices. Whether *ringo* 'an apple/apples' is singular or plural depends on the context and is not marked in the noun form. It seems reasonable to consider that the noun potentially belongs to either a definite NP or an indefinite NP (see section 4.2.7 for discussion of the semantics of definites parallel to NP-related FNQs). Note that any function applicable to individuals is also applicable to groups, and vice versa (see section 4.2.8.2) in the standard plural theory (Landman 1989a, b, 1996, 2000). Correspondingly, it can be said that Japanese FNQ constructions allow non-distributive (or

collective) construals in the right context.

For the sake of completeness, we propose possible lexical representations for FNQ sentences, as exemplified in ((4.63) a-d). In this way, each grammatical expression can be associated with more than one interpretation (Partee 2008: 1). We take a position that semantics generates all the meanings possible, and a preferred (hence, optimal) meaning is selected in accordance with pragmatics (e.g., information structure). One of the merits of taking this line of approach is that constraints of various natures (syntactic, semantic, or pragmatic) interact with each other in a flexible grammatical theory such as CCG.[96]

In order to obtain the cardinal interpretation in ((4.63) a), we will make use of a (silent) existential quantifier (∃), which is mapped onto syntactic structure as represented in (4.1) above. Importantly, the semantic representations in ((4.63) a-d) are compatible with representations embodying structured event quantification (as discussed in section 4.2.3).

(4.63) (=(1.3))

Gakusei ga (//) *go-nin* tsukue o mochiageta.

student Nom five-Cl desk Acc lifted

(i) 'Five (of the) students lifted a desk (individually).' **[Distributive]**

(ii) 'Five students lifted a desk (together)' **[Non-distributive]**

Possible semantic representations for (4.63):

a. $\exists$ e([$\exists$ X:*student'(X) $\wedge$ |X|=5](*lift.a.desk'(e) $\wedge$ *Ag(e)=X)) $\Rightarrow$ (−p, +d)

b. $\exists$ e([$\exists$ X:*student'(X) $\wedge$ |X|=5](*lift.a.desk'(e) $\wedge$ *Ag(e)=↑(X))) $\Rightarrow$ (−p, −d)

[96] In this grammar model, multiple syntactic analyses are generated at the point of ambiguity. The selection of one analysis is guided not only by syntactic information but also by other non-syntactic types of information including frequency, semantic/pragmatic plausibility, and others. When selecting one analysis to pursue, the parser looks at how good the match is between the prosodic structure and possible syntactic structures. (See Blodgett 2004, and Steedman and Baldridge 2011 for more discussion, and see Chapter 6 for an analysis of Japanese FNQs in CCG.)

c. ∃ e([∃ X:*student'(X)])(*lift.a.desk'(e) ∧ *Ag(e)=X ∧ |X|=5)) ⇒ (+p, +d)

d. ∃ e ([∃X:*student'(X)](*lift.a.desk'(e) ∧ *Ag(e)=↑(X) ∧ |X|=5)) ⇒ (+p, −d)

Given that the term *lift.a.desk'* in (4.63) takes both an individual atom and a group atom, at least six possible interpretations for the FNQ construction are constructed; (+part, +dist) is from ((4.63) c), (+part, -dist) from ((4.63) d), (−part, +dist) from ((4.63) a), and (−part, −dist) from ((4.63) b). ((4.63) a) and ((4.63) b) are constructed as NP-related FNQs, while ((4.63) c) and ((4.63) d) are constructed as VP-related FNQs. When the host NP denotes a type, the type is unspecified with respect to quantity, and a partitive reading does not arise from ((4.63) b). This follows from the basic assumption that topical material cannot be interpreted as being in the nuclear scope of a quantifier (see also Cresti 1995 and Van Valin 2005), which is accounted for by ((4.63) a-d).

Following Link and Landman, we assume that non-distributive interpretations are made possible by the group operator '↑'. In ((4.63) b, d), it applies first in the restriction clause, and enters into the nuclear scope (see Landman 1989, 2000; Nakanishi 2004, 2007, 2008; Tancredi 2005 for related discussions). The distributive construal obtains, directly entering an individual sum into the pluralized domain in the nuclear scope. The distinction between partitivity and non-partitivity is reflected in the restriction (nominal) contents, i.e., in ((4.63) c, d) the information conveyed by the FNQ is not specified there, which induces partitivity. ((4.63) c) and ((4.63) d) are construed as VP-related FNQs, while ((4.63) a) and ((4.63) b) are construed as NP-related FNQs.

Note that we have a special semantics for NP-related FNQs as in ((4.63) a, b) where when the host NP denotes something like a type, the type appears to be unspecified with respect to quantity, and a partitive reading does not arise from ((4.63) a, b). The semantics in ((4.63) a, b) is tenable because it is closely related to the assumption that topical material cannot be interpreted as being in the nuclear scope of a quantifier (see section 3.1.4 (Chapter3), and Van Valin 2005: Chapter 3 for further discussion of this point).

With the architecture in place, as shown in ((4.63) a-d), pragmatics (including intonation) is utilized to select among several readings generated by the grammar, as in other cases of disambiguation. To be more specific, in information-structure terms, the default reading of the FNQ (i.e., the distributive reading) hosted by the subject NP will simply reflect the information structure of the sentence in the kinds of discourse contents that the speakers could imagine for it, rather than sorts of particular semantics that Kobuchi and Nakanishi propose. A preferred reading is often selected with the help of intonation (in accordance with the information-structure) from a set of available readings that are captured by the semantic representations, as exemplified in ((4.63) a-d).

4.2.9 Revisiting the atomicity constraint

We have argued that there are certain cases where the FNQ is clearly not part of the predicate, but rather combines syntactically and semantically with the host noun (i.e., subject). In the previous subsection 4.2.8, we have drawn a general picture of the event semantics for FNQ constructions in (4.63), and found that the semantic generalizations proposed by researchers including Nakanishi and Kobuchi are dubious. Yet, we have not found that the event semantic approach is superior to other semantic analyses including the traditional one by Link (1983) which makes use of a D(istributive)-operator. We will continue assuming that in nearly all cases the FNQ is structurally ambiguous without contextual/prosodic cues between a VP-related reading and an NP-related reading. To substantiate this idea, we will reexamine the atomicity constraint, which has been held to be peculiar to Japanese FNQs by Nakanishi (2004, 2007, 2008). However, there are numerous phenomena in which the interaction of syntax and semantics is neutralized for discourse-contextual purposes. The atomicity constraint would not have to be postulated for the FNQ semantics.

Kobuchi (2003: 26), similarly to Nakanishi, claims that an obligatorily distributive reading of the FNQ (corresponding to the VP-related FNQ in our terms) sentence results directly from the atomicity of the classifier denotation as a simple set-theoretical logical consequence.[97] To support this claim, she provides the example in (4.64) (the judgment is Kobuchi's), which is unacceptable without any prosodic addition such as emphasis or focus.

(4.64) (cf. ((1.4) a))

??**Kodomo ga** kinoo *san-nin* sono inu o koroshita.
children Nom yesterday 3-Cl that dog Acc killed
'Three children killed the dog yesterday.'

It has been proposed that an FNQ is pragmatically ill-formed with a once-only predicate (Kobuchi 2003, 2007; Nakanishi 2004, 2007, 2008). However, here again, it seems inappropriate to describe the Japanese FNQ construction without taking into consideration the discourse (and particular accompanying intonation).

As Miyagawa and Arikawa (2007: 661-2) note, the acceptability judgment for sentence (4.64) greatly improves if a pause is placed immediately after the FNQ. The acceptability of the sentence clearly demonstrates that the source of the ill-formedness, if any, is not purely syntactic and semantic. This can be translated in the present account as follows. One strategy to avoid infelicitous readings is to try to form a single (downtrend) intonational domain for the FNQ and its associate NP (indicated by shadowing as in *Kodomo ga kinoo san-nin*) as a single prosodic dimension sometimes having optionally a pause (or other lexical items like *kinoo* 'yesterday') in cases where the FNQ does not exhibit a sharp F0-rise but shows deaccenting or downstep (see

[97] With regard to collective readings, Kobuchi assumes that they are obtained via Link's (1983) group operator '↑' which applies only in the nominal projection. Accordingly, FNQs never generate collectivity in her theory (see Nakanishi 2004, 2007, 2008 for a similar view). As will be clear below, this is too rigid.

section 5.3 for description of intonation contours pertaining to FNQ constructions).[98] This leads to a contextually appropriate interpretation.

Due to this lowering of the phrase, a non-distributive reading obtains in an example like (4.64) when the denotation of the predicate is considered a singleton, as in 'kill somebody'. Our explanation is that (4.64) asserts that the quantity of children, is taken as something like a single mass entity, which can be measured out as *san-nin*. This is possible indeed if we consider that Japanese noun denotation consists of both 'atoms' and 'sums' under Link's (1983) theory of plurality. A set noun can apply distributively to each set of atoms or collectively to a single set of atoms. This gives rise to both a distributive and a non-distributive reading.

4.2.10 Plurality and non-distributive interpretations

An object-denoting noun such as *gakusei* 'student' can be interpreted as singular or plural. Japanese NPs are ambiguous between a definite and an indefinite reading. In section 4.2.8, we considered a widely held view of NPs with plural nouns, and some of the ways in which such NPs are interpreted depending on what is being predicated of their denotation, and pointed out similarities between such NPs and NP-related FNQs.

To conceive of these points in relation to plurality of nouns, let us turn back to an (at first blush) unacceptable example like (1.4), repeated in (4.65), which has a non-distributive reading with non-partitivity. What happens here is, for a felicitous interpretation to follow, (4.65) should have a structure like ((4.1) c) (= non-local NP-related FNQ structure) and a semantic representation such as ((4.63) b), (－p, －d).

[98] We also assume that the distance between the FNQ and its host noun and the nature of the material intervening between the FNQ and its host noun are only restricted by the possibility that the intervening material can be deaccented, rather than by constraints on LF movement or lexical-semantic restriction (see section 5.3).

(4.65) (cf. (1.4))

Gakusei ga kinoo *san-nin* // Peter o koroshita.
student Nom yesterday three-Cl Peter Acc killed
'Three students (as a group) killed Peter yesterday.'

(cf. Nakanishi 2007: 53)

As discussed in section 4.2.7, definite descriptions involving plurals are taken to denote a totality (equivalent to a maximality operator) of related items fitting the description expressed in the NP. We will extend this view to FNQ constructions by claiming that the FNQ (particularly, the NP-related FNQ) provides a totality effect. This line of analysis makes it clear that the entire subject (i.e., all the members that make up the subject) enters into quantification in relation to the FNQ.[99]

Gunji and Hasida (1998: 65) claim that the default reading of the FNQ hosted by the subject NP is distributive. An FNQ is more likely to be associated with a distributive reading compared to a non-FNQ (i.e., [NP *no* NQ]).

(4.66)

a. **Gakusei ga** *san-nin* kabin o mochiageta.
student Nom 3-Cl vase Acc lifted
'Three students (each) lifted a/the vase.'

b. *San-nin no* **gakusei ga** kabin o mochiageta.
3-Cl Gen student Nom verse Acc lifted
'Three students lifted a/the vase.'

Concerning the interpretation of (4.66), without contextual or prosodic cues, both *the student* and *a student* are available. However, since the subject host needs to have a distributive reading (by Gunji and Hasidas' assumption), the

[99] We will see in Chapter 6 the possibility that distributive interpretation and non-distributive interpretation interact with scope for the subject NP.

former interpretation is not likely. Note, however, this is not the only possible interpretation. Another possibility is that the quantity denoted by the quantifier in an FNQ sentence does not always contribute to the creation of a new (sub)set (as we saw in (1.3) in Chapter 1). That is, the set referred to by an NP-related FNQ may be used when the set is recognized as an established (not new) one in the discourse; such an FNQ should have an exhaustive reading by default (see, e.g., ((4.49) a), (4.65)).[100]

Note in passing that the same thing can be said of sentences like (4.67) (from Kobuchi 2003: 32). (The judgment for the sentence is hers.) The preferred interpretation would require the FNQ to be interpreted with respect to individuals, i.e., thirty (and only thirty) students.

(4.67)

??**Kodomo ga** *sanjuu-nin* gasshoo-shita.
child Nom thirty-Cl sang in chorus
'Thirty children sang in chorus.'

Kobuchi claims that sentence (4.67) can only be well-formed under a shift to a non-quantificational amount term reading of the NQ. Setting this aside as a special interpretive possibility, under a quantificational reading an FNQ causes a sentence containing a non-distributive (collective in Nakanishi's terms) predicate to be semantically ill-formed. Since in (4.67) there are no atomic individuals who have the property of singing in chorus, the sentence again results in ill-formedness.

However, here too, sentence (4.67) increases acceptability when a pause occurs right after the FNQ, just as is the case in (4.67). Hence, it can be

[100] Due to the lack of status of an established set, FNQs sometimes cannot easily have a non-distributive reading and each instantiated entity/object has to be individually involved in the action/event to have a distributive reading. FNQ interpretation, distributive or non-distributive, may be to a large extent determined by pragmatic factors (including intonation) and real world knowledge shared by the speaker and hearer, rather than syntactic factors.

construed as an NP-related FNQ.[101] This also indicates that non-partitivity denotation (often related to non-distributive readings) can be obtained in non-local FNQ constructions as well, as long as it does not cause inconsistency in sentence interpretation and intonational pattern. This helps greatly in understanding how the well-formedness of FNQ sentences is ultimately determined by contexts associated with relevant information structure. Thus, sentences such as (4.64), (4.65) and (4.67) are representative cases where different (plausible) contexts can disambiguate the two interpretations (i.e., distributive and non-distributive), since in the right context (with an associated prosody) FNQs serve as non-distributive expressions.

Given that processing ambiguity is systematic and general in FNQ sentences in Japanese, we can say that the ambiguity is likely to be resolved by contextual factors, which often accompany particular intonational contours (in relation to particular contexts). Assuredly, pitch accents regularly signal that the referent of a given constituent is new, informative or salient in the context. However, pitch accents may also signal something else – for instance, that the speaker attaches special importance to a given constituent or wishes to highlight it as new. This is the underlying assumption for the uses of the NP-related FNQs.

4.3 More on non-distributive interpretations

It has been pointed out that in the literature that the FNQ construction generates distributive interpretation, but this semantic requirement seems too strong, as implied in the discussion in section 4.2. We will re-examine data in the literature involving non-distributive readings of FNQ constructions, which

[101] Alternatively, if a pause is put immediately before the FNQ, then a VP-related FNQ interpretation might be available (as long as the constituent following the FNQ forms a distinct intonational phrase). In such cases, when the given sentence is pronounced with stress on the quantifier, it is highly likely that focus is imposed on the FNQ, so that unnaturalness will be removed from the sentence.

are unresolved by Nakanishi (2007: Chapter 2), positing that the FNQ obligatorily yields distributivity (see also Kobuchi (2003, 2007)). We will see that it is not always true that the semantic constraint applies to FNQ examples. The central empirical part of my claim is that such a requirement seems to be relaxed in contexts such as those in (4.64), (4.65) and (4.67) above. While Nakanishi does not have an explanation to offer for why the requirements should be relaxed in FNQ sentences, Cases 1-3 given below suggest that there are many cases where FNQs that appear to be VP-related can actually receive the NP-related interpretation when the appropriate context is provided.

4.3.1 Case 1: Non-distributivity with progressive

Let us first consider the following examples involving progressive predicates.

(4.68) =(Nakanishi's (116))

a. ??**Gakusei ga** kinoo *san-nin* sono tsukue o kowashi-ta.
student Nom yesterday three-Cl that table Acc break-Past
'Three students broke that table yesterday.'

b. **Gakusei ga** kinoo *san-nin* sono tsukue o kowashi-te-ita.
student Nom yesterday three-Cl that table Acc break-Prog-Past
'Three students were breaking that table yesterday.'

Nakanishi (2004, 2007, 2008) claims that Japanese FNQ constructions permit distributive readings only. However, ((4.68) a) may be used felicitously to give an 'on the scene' report with a pause right after the FNQ. As Nakanishi points out, the availability of collective readings seems to depend on the aspect of verbal predicates. Specifically, collective readings are available more easily with progressive VPs, as shown in ((4.68) b). In the present account, the above

observed empirical behavior indicates that a notable semantic property pertaining to the FNQ and its host NP phrase in the sentence is that it behaves as if it were an existential quantifier which receives an existential (or cardinal) interpretation (Milsark 1974), and in the V-*te iru* structure (-*te* form of the verb and the existential verb *iru*) the quantifier force takes wide scope (e.g., Begehlli 1997).[102] In such cases, no matter how we may construct the context, the truth conditions will simply be those of an existential.

In those sentences expressing recognition of the existence of a situation, the NP-related FNQ is likely to be interpreted as something that denotes speaker's perception of the existence of an object/entity within DP (NP), while the VP-related FNQ is normally linked to the whole event described by the verbal predicate, where the speaker first introduces the subject as topic at the moment of uttering the sentence and the comments on it with the predicate. A relevant question is why FNQ constructions permit non-distributive readings when the VP is atelic as in the following examples.

(4.69) =(Nakanishi's ((122) b))

a. **Gakusei ga** kinoo *san-nin* kaato o oshi-ta.
student Nom yesterday 3-Cl cart Acc push-Past
'Three students pushed a cart yesterday.'
(^{OK}distributive, ^{OK}collective)

b. **Gakusei ga** kinoo *san-nin* kaato o mise made oshi-ta.
student Nom yesterday 3-Cl cart Acc store to push-Past
'Three students pushed a cart to the store yesterday.'
(^{OK}distributive, ^{OK}collective)

[102] This idea seems well-motivated in view of the fact that FNQ sentences permit a collective reading with a progressive predicate -*te ita* 'was/were doing' and a perception verb like *mita* 'saw' used in the matrix clause (see Yamamori 2006 for a relevant discussion), as shown in (i) (taken from Yamamori 2006: 128), respectively.

(i) **Kodomo ga** umide *futari* ?*oyoida/oyogu no o mita.
children Nom sea in 2-Cl swam/swim Comp Acc saw
'(I) saw two children swam in the sea.'

If the observation that both ((4.69) a) and ((4.69) b) allow non-distributive readings is correct, then the account developed in Nakanishi (2007) would lose the generalization that FNQ constructions permit non-distributive readings with atelic, but not telic, predicates.

Further examples are provided in (4.70) below, in which the subject NP in stative sentences can also host an FNQ as in (4.70), where the FNQ occurs in a floated position, and is yet construed with the preceding noun *gakusei* 'student(s)'. Note that these sentences may be uttered out of the blue (without contexts). This being the case, in the present account, what is crucial in (4.70) is that the members of the host NP denotation constitute a single (and unique) domain of 'quantification' (something like a property-denoting strategy may be taken when the denotation as a set is highlighted in the discourse), resulting in a non-partitive reading, which is considered an important condition for the interpretability of NP-related FNQs (see section 4.2.7).

(4.70)

a. **Gakusei ga** *san-nin* byooki-da.
   student Nom three-Cl be.sick-Cop
   'Three students are sick.'

b. Sono ikimono wa **me ga** *mit-tsu* aru.
   the creature Top eye Nom three-Cl exist
   'The creature has three eyes.'

Nakanishi (2007, 2008) reports that although stative verbs are not in general available for FNQ constructions, examples like (4.70) indicate that the semantic aspect of the verbs does not contribute clearly to FNQ constructions (contrary to Mihara 1998; Kobuchi 2003, 2007; Nakanishi 2004, 2007, 2008; Tanaka 2008). Hence, Nakanishi's quantifier float condition related to the aspectuality of verbs seems too strict. This implies that an event-semantic

representation of an FNQ is determined in context.

4.3.2 Case 2: Non-distributivity with *isshoni* 'together'

When collectivizing adverbs such as *isshoni* 'together' co-occur with FNQs, as in (4.71), only non-distributive readings are available.

(4.71) =(Nakanishi's (126))

Otokonoko ga	*san-nin*	isshoni	booto o	tsukut-ta.
boys Nom	three-Cl	together	boat Acc	make-Past

'Three boys built a boat together yesterday.'

Nakanishi (2007) claims that a seemingly collective (or non-distributive) reading with a collectivizer is not collective but distributive in that each building-a-boat event is mapped to each group of three boys. However, it is plausible that the collectivizing adverbs, as in (4.71), relying on Landman's (1989, 2000) group formation operator ↑, map a sum of individuals (e.g., $x \cup_I y \cup_I z$) to an atomic group individual (e.g., $\uparrow(x \cup_I y \cup_I z)$) (see section 4.2.8.3). For instance, (4.71) forms a group of three boys, yielding the interpretation that one group consisting of three boys built a model boat. In this case, (4.71) means that a group of three boys built a boat, where there was only one agent, namely a group of three boys.

Nakanishi (2007) also contends that native speakers might manipulate the existence of collectivizing adverbs. For instance, non-distributive interpretations obtain when the copula *-de* after the FNQ (e.g., *san-nin-de* 'by three (as a group)'). Even when an FNQ is not followed by *-de*, speakers may obtain 'illusive' non-distributive reading by positing a covert *-de*. This is, however, a speculative possibility and would require independent confirmation.

Such an effect that might contribute to non-distributive readings should be explained semantically or pragmatically in an explicit manner. In our view,

as previously mentioned, this statement should be covered in the following manner: What makes NP-related FNQ examples like (4.71) possible is using the FNQ *san-nin* to refer back to a particular plural individual, consisting of the established set (implicitly) described by the associate noun *gakusei* 'student(s)' (see section 4.2.8). This means that an NP-related quantifier could be interpreted as the quantitative attribute of an established (sub)set, hence in certain contexts the NP-related FNQ is allowed to have an exhaustive (or non-partitive) reading rather than a particular (or partitive) reading.

Another possible explanation is that we can attribute the different readings to a (non-)presuppositionality effect with the host NP (cf. Ishii 1998, 1999). If this is correct, then the host noun is not necessarily limited to topic, contrary to Takami's (1998, 2001) and Hatori's (2002) claim that an NP in a sentence allows quantifier float only if it can function as a topic of the sentence (see section 3.1.4 (Chapter 3)).[103]

To investigate the issue further, let us consider Brisson's (1998) theory concerning English collectivizing adverbials, which supposedly force collectivity (non-distributivity in our terms). According to Brisson, the distribution of *all* and *every* differs with respect to a subclass of collectivizing adverbials, as shown in (4.72) and (4.73) (taken from Brisson 1998:141).

(4.72)
All the planes landed together/in formation/as a group/at once.

(4.73)
*Every plane landed together/in formation/as a group/at once.

Brisson claims that a collectivizing adverb takes a predicate that applies to

[103] Here it is worth mentioning that Ohki (1987) points out in his descriptive work that the host NP must be a potentially focal element, which is contrary to Takami's (1998) claim, though Ohki does not discuss the difference between NP-related and VP-related FNQs.

atomic individuals, such as *land*, and appears to turn it into a predicate that will apply only to pluralities. An expression like *together* involves a kind of quantification over individual parts of a plural NP. The same explanation holds true for examples in Japanese like (4.74) (taken from Mizuguchi 2004: 83, and the judgment is hers). In the example, a common noun *gakusei* 'student(s)' is used which denotes a set containing both sums and atoms.[104]

(4.74)

***Gakusei ga**	*san-nin*	isshoni	kabin o	mochiageta.
student Nom	3-Cl	together	vase Acc	lifted

'Three students lifted the vase together.'

Mizuguchi claims that (4.74) could be acceptable when *isshoni* means 'at the same time', but when it means 'together', the sentence is unacceptable. She explains the unacceptability in (4.74) by saying that post-nominal classifier phrases (FNQs in our terms) do not evoke the collective reading, because, she claims, the sets individuated by post-nominal classifier phrases are not individuated further.

However, this hypothesis needs to be examined a little further. The case in question runs counter to Mizuguchi's expectation. There are various ways to improve the grammaticality of FNQ sentences such as (4.74). For instance, it yields the intended reading and becomes better if the FNQ can be construed as an NP-related FNQ, quantifying over the individuals (here *gakusei* 'student') resulting in a non-distributive reading, which is compatible with the denotation of *isshoni* 'together'. If the speaker puts a pause immediately after *san-nin* (rather than after the subject), the sentence is judged as being considerably more acceptable (if still not perfect), denoting the students all joined forces and lifted the vase, resulting in a non-distributive reading (see section 3.2.3

[104] In general, Japanese nouns are not directly combined with numbers: sometimes they refer to plural entities, while at other times they refer to singular individuals (see Mizuguchi (2004: Chapter 3) for a detailed and extensive discussion of this matter).

(Chapter 3) for similar cases).

4.3.3 Case 3: Non-distributivity with collective predicates

The following examples show that FNQ constructions are compatible with collective predicates such as *torikakomu* 'surround' and *atsumaru* 'gather'.

(4.75) =(Nakanishi's ((129) b))
Heishi ga kinoo *gohyaku-nin* machi o torikakon-da.
soldier Nom yesterday 500-Cl city Acc surround-Past
'Five hundred soldiers surrounded the city yesterday.'

(4.76) =(Nakanishi's ((131) b))
Gakusei ga kinoo *juu-nin* atsumat-ta.
student Nom yesterday 10-Cl gather-Past
'Ten students gathered yesterday.'

The fact that the examples in (4.75) and (4.76) are acceptable appears to be problematic for Nakanishi's monotonicity constraint[105] (which constitutes the core of her theory of FNQs), because the constraint ought to exclude collective readings, though she supposes that predicates such as *gather* are not genuinely collective but distributive, relying on Dowty (1987). On this supposition, although the collective predicate *gather* does not distribute down to the individual members of a group, it distributively entails a property of the members of the group (e.g. each undergoing a change of location). This

[105] Nakanishi (2007) applies the notion of monotonicity (describing patterns of entailment between sets and subsets) that Schwarzschild (2002) discusses in terms of nominal domain to the verbal domain as well. That is, what she claims is that in the non-split MP (Measure Phrase) construction monotonicity must be respected in the nominal domain, while in split the MP construction it must be respected in the verbal domain. The former corresponds to our non-FNQs, and the latter to our FNQs.

account could work under the definition of distributivity in reference to agents rather than events (see section 3.1 (Chapter 3)). However, a problem is that the approach presented by Nakanishi in order to account for data like (4.75-6) does not really help in considering why the collective verb is used in the sentence to begin with. Note that it is impossible to say *Gakuseiga kinoo hitori/hutari astumatta* 'One student/Two students gathered yesterday'.[106] This indicates that Nakanishi's distributivity entailment (e.g., each individual is undergoing a change of location) is in fact not necessarily available for all cases involving collective predicates. For this reason, Nakanishi's account of examples (4.75-6) is untenable.

We will instead argue that Japanese FNQs have two uses and that a distinction must be drawn between distributive and non-distributive readings. That is to say, non-distributivity as well as distributivity exists in FNQ constructions from the outset. Extra-syntactic factors will choose which reading fits well in the context. This does not require us to suppose the process of change in meaning (as posited by Nakanishi) when we encounter sentences allowing non-distributive readings, which are not expected from Nakanishi's theory. In Chapter 4, we claimed that FNQ sentences can in principle have any of the four possible feature combinations allowed by the semantic features [＋/－part(itive)] and [＋/－dist(ributive)] (see section 4.2.8.2), and that when this sort of sentence is placed in the right context, a collective implication observed in the example is simply an instantiation of either (＋part, －dist) (e.g., (4.63b)) or (−part, −dist) (e.g., (4.63c)), depending on the context. Thus, it seems unproblematic to allow for the generation of both collective and distributive interpretations within our semantic analysis. The same account applies to other examples, such as the following.

[106] Depending on the context, 'two students gathered yesterday' may sound only mildly unacceptable in Japanese.

(4.77) (cf. (1.4))

#**Otoko ga** // *san-nin* Taknaka o koroshi-ta.
man Nom three-Cl Tanaka Acc kill-Past
'Three men killed Tanaka.' (Kobuchi 2007: 110)
(cf. Otokoga san-nin // Tanaka o koroshita.)

In choosing the preferred interpretation out of possible interpretations, as provided in ((4.63) a-d), a plausible way to conduct a compositional interpretation procedure is to take into account context, intonation, lexical meaning, and structure, because all can interact in the determination of the preferred interpretation. In our account, in light of data like (4.75), (4.76) and (4.77), syntactic differences corresponding to the different meanings that are not reflected in prosodic structure cannot contribute to the disambiguation of potentially ambiguous FNQ sentences. Hence, it seems unrealistic to assume that a semantic interpretation is derived (in a more complicated manner) only after a discourse as a whole has been processed, as researchers including Kobuchi (2003, 2007) and Nakanishi (2004, 2007, 2008) suppose.

4.4 Summary

A major portion of the argument in this chapter has been devoted to validating the presence and motivation of the distinction between the two types of FNQs to fully explain FNQ placement and interpretation. Syntactically, this is plausible if we set up flexible structuring in the syntax of Japanese (as illustrated in (4.1)), where we argued that the syntactic process of transfer of arguments plays an important role in accounting for FNQ location and the associated reading. We have also suggested that to determine FNQ placement and interpretation a phonological analysis needs to accompany the syntactic analysis (as will be discussed in Chapter 5). Semantically, what is crucial to the distinction of the two types of FNQs is whether an FNQ is expressed in the use

of quantification or referential noun. This distinction is required when we consider the variance with FNQ interpretation. In particular, we have shown that NP-related FNQs have much in common with referential nouns (though they are seemingly non-quantificational).

To recapitulate, the NP-related FNQ often behaves as a sort of referring expression, when we consider the fact that the NP-related FNQs tend to be defocalized and anaphoric(-like) nominals rather than adverbials or (secondary) predicates (see Miyagawa 1989; Fukushima 1991, 2003 for analyses of FNQs as predicates). In discourse-semantic terms, we claimed that the NP-related FNQ can be interpreted as something that denotes a speaker's/hearer's perception of the existence of some entity (or individual), whereas the VP-related FNQ is linked to the whole event (or action) described by the verbal predicate. Considering these observations and the analysis of quantifier float in parallel with existential *there*-constructions by Kuroda (2008), we have argued in section 4.2.5 that NP-related FNQs can be treated as quantifiers.

We have also introduced a tripartite quantificational structure as a core interpretive mechanism required for representing FNQ semantics adequately, which integrates information structure into quantification. This line of analysis seems compatible with Partee's (1973) theory, in which she introduces the distinction between a 'loose' version of syntax (generating all possible readings) and a 'strong' version (generating preferred readings only). We have argued for the former.

Further research is of course required to determine whether the approach illustrated in this chapter is indeed plausible. However, it seems significant that examples judged unacceptable in the literature turn out to be acceptable once they are put in the right context, specifically when either the FNQ or the subject NP receives focus in the sentence. Previous studies have taken little or no account of contexts in which FNQs are used. To solve the problem, we have argued for a more wide-ranging analysis of the semantic-pragmatics of

Japanese FNQs, while maintaining an analysis that does not require a highly articulated semantics (proposed in Kobuchi 2003). The current analysis of FNQ syntax and semantics seems advantageous: The tripartite quantificational representation, in accordance with topic/focus partitioning, is helpful to account for the FNQ construction viewed as a focus-affected phenomenon, whose interpretation is crucially contingent upon information status in the context.

In the next chapter, we will explore prosody and context, which appear to be as important as syntax and semantics for the interpretation of FNQ sentences.

CHAPTER 5

Information Structure and Prosody in FNQ Constructions

This chapter focuses on the relationship between information structure and prosody. It is argued that the pitch reset or downstep on the FNQ is closely associated with information structure, and, in the latter part of the chapter, comprehension tests are employed to verify this hypothesis. The results of these tests strongly indicate that there is in fact an interaction between prosodic phrasing and interpretation in relation to information structure.

5.1. Information structure in FNQ constructions

In the previous chapter, we focused on the syntax and semantics of Japanese FNQ constructions and found that FNQ interpretation should not be dealt with without taking context into account. A fundamental question arises as to what conception of meaning is more appropriate to reflect how linguistic processing depends crucially on context. The key is the information structure, which refers to an independent level of grammar encoding the packaging of the linguistic message to meet discourse requirements (Vallduví 1992; Lambrecht 1994; Steedman 2000a, b; Van Valin 2005).[107] Information structure in this study is taken to involve those aspects of sentence grammar that are required for the integration of a sentence into discourse. That is to say, certain sentential structures can be felicitously integrated into certain discourses while others cannot.

Following researchers including Chafe (1976), Vallduví (1992), Lambrecht (1994), Birner and Ward (1998), and Steedman (2000a, b), we will emphasize that there is a need to package information on focus and non-focus.

[107] An underlying assumption is that utterances are pragmatically structured and that this structuring does not disappear (for a description, see Kadmon 2001; Dalrymple and Nikolaeva 2010).

This enables the listener to identify which part of an utterance represents an actual contribution to the information state at the time of the utterance and which part represents what is already subsumed (or presupposed) in this information state (Lambrecht 1994: 197).

5.1.1. Information partition of an utterance

General arguments come from the observation that the varieties of syntax and information structure of the language display structures in which word order appears to be conditioned by aspects of information structure (Vallduví 1990, 1992). Many approaches typically include one or both of the following distinctions: "givenness" and "aboutness" (De Kuthy 2009: 5).

Information structure can be realized phonologically; i.e., the utterance is divided into different intonational phrases.[108] These phrases basically exhibit an internal structure. To understand the structural aspects of the information structure embodied in a sentence, it seems essential to consider first (at least) the two aspects of information structure in (5.1) and (5.2) based on De Kuthy's (2009) summary and review of these notions.[109]

(5.1)

Givenness: A distinction between

(i) What is new information advancing the discourse (**Focus**)

[108] There is considerable crosslinguistic variation as to the grammatical devices that languages employ to mark information structure. English, for instance, mainly exploits phonological markers (accent placement), while languages such as Catalan, Finnish, Greek, and Hungarian have been argued to rely mainly on word order (Horvath 1995; Kiss 1995b; Tsimpli 1995; Vallduví 1995; Vilkuna 1995). Japanese employs both phonological and syntactic means for the realization of information structure.

[109] Vallduví (1992) develops the idea of information packaging, where he assumes an information structure that merges the two most prominent aspects of information structure (focus/background, and topic/comment): focus (= focus and comment), link (= background and topic), and tail (= background and comment). Vallduví's tripartite organization of information structure combines previous distinctions such as *theme-rheme*, *topic comment*, and *ground-focus* (Halliday 1967). In particular, Vallduví's link corresponds to traditional notions of topic or theme.

(ii) What is known, i.e., anchoring the sentence in existing (or presupposed) knowledge or discourse (**Background**)

Note that the focus part of a sentence can be one word, a phrase, or the whole sentence. The background part of the sentence can be derived from the focus part; i.e., it is the part of the utterance that is not the focus.

(5.2)

Aboutness: A distinction between

(i) What the utterance is about (**Topic/Theme**)

(ii) What the speaker has to say about it (**Comment/Rheme**)

The above two characteristic features (i.e., givenness and aboutness) partition a sentence like 5.3a as shown in 5.3b (focused phrases are in the upper case):

(5.3)

a. What does John drink?

b.

background		*focus*
John	drinks	BEER.
topic	*comment*	

(De Kuthy 2009: 5)

Research has shown that the hearer vs. discourse-status distinction is an important one for distinguishing among functionally distinct syntactic constructions (see, e.g., (5.2)). We will devote some more space to the discussion of distinctive information structures rendered by the different layers, advocated in many studies.

Molnár (1991, 1993), for example, differentiates between the layer of

the message, the layer of the hearer, and the layer of speaker.[110] Within each of these layers, there is a particular dichotomy:

(5.4)

a. *Message*: Topic – Comment

b. *Hearer*: Theme – Rheme

c. *Speaker*: Background – Focus

The message layer in (5.4), as Molnár claims, can be divided into a part that the utterance is about (topic; *T*) and a part that contains the actual information-structural predication (comment; *C*). Furthermore, the speaker organizes the utterance with regard to their presuppositions as to what is given (theme; *Th*) and new information (rheme; *Rh*) to the hearer. Finally, the speaker highlights what is important (focus; *F*) and less important (background; *B*). Note that, in this view, topic and focus are not mutually exclusive concepts as is often claimed (see Gundel 1999, 2004 and references therein). Rather, they apply on different layers. Take (5.5) for instance. In this case, the three layers coincide, as indicated in parentheses.

(5.5)

[*Peter bought a new car.*] *It*(=*T/Th/B*) *is green*(=*C/Rh/F*).

A topic prototypically contains thematic material and forms the background whereas a focus domain coincides with the comment and is represented by rhematic information. This implies that, at least often, someone who uses a sentence with topic marking has a specific contrasting question in mind and intends for the listener to identify that contrasting question (see, e.g., Lambrecht 1994; Rooth 1992, 2005; Steedman 2000a, b).

Another point that Molnár makes is that the concepts of topic and focus

[110] ((5.4) b) and ((5.4) c) are covered in the CCG formalization (see Chapter 6).

are not mutually exclusive but apply dichotomously, as is often claimed in the literature (see Gundel 1999, 2004 and references therein). Take a look at (5.6).

(5.6)
Speaker A: What happened?
Speaker B: [[*Peter*]$_T$ [*had an ACcident*]$_C$]$_F$

Although the utterance in ((5.6) B) is the so-called all-focus (or broad focus) – the question *What happened?* typically triggers such a reading – and therefore does not display any background material, it is possible to discern a topic-comment structure within it, as indicated. This means that a topic should occur within a focus domain, which provides some support for the assumption that topic and focus operate on different layers. Furthermore, the fact that the topic-comment, theme-rheme, and background-focus dichotomies do not necessarily coincide is a strong argument for keeping the different levels apart. This view is, in fact, compatible with the description of information structure adopted in CCG derivation. Steedman (2000a, b) provides a basis for the above informational partition based on the formalism of CCG. In the current study, we provide an explanation for the differences in acceptability based on the focus-background structure with the *theme/rheme* distribution of sentences in the CCG model (see Chapter 6). For this, an important assumption in CCG is that a focus construction partitions the utterance into focus and background, where focus identifies the entity from a set of alternatives for which the proposition holds and the background contains non-prominent, discourse-old material. We will offer grounds for formulating a principle restricting the occurrence of the FNQ construction to an adequate *theme-rheme* component in conjunction with the focus-background partition in CCG. (On making the most of the two-dimensional information model in CCG, see Chapter 6).

5.1.2. Information flow

This subsection describes the interpretation of FNQs in terms of information flow, frequently observed in the processing of language. As has been mentioned at various points, a number of factors (e.g., word order and parsing strategies on the part of the hearer relying on contextual/phonological cues) must be considered which could affect the speaker's intent to express, or the hearer's comprehension of a particular information structure.

In terms of functional syntax, Takami (1998), basing his claim on Kuno (1978, 1980), claims that it is desirable for a Japanese sentence to have only one newly introduced piece of information right before the verb. This assumption leads Takami to propose that, if the object NP is definite, then the subject NP and the subject-related FNQ must be separated (see also Kobayashi and Yoshimoto 2003 for a formal analysis contingent upon Takami's assumption). Although it is not always evident to what extent phonological means alone can express information structure, word order largely reflects the information structure. Japanese, for example, is regarded as a language in which linearity plays a role in determining discourse roles in the unmarked case, as illustrated in 5.7 (see Kuno 1978, 1980; Kuno and Takami 2001).

(5.7)
Topic = Given information > Focus = New information > Predicate

According to Kuno (1978), the pre-verbal position in Japanese is the unmarked position for informational foci. The notion of contrastiveness is presumably associated with quantifier float (in particular VP-related FNQs), which facilitates the speaker's processing of the sentence, so that the FNQ sentence presents little difficulty for parsing in regard to its informational structure, which is often demarcated by the (unmarked) intonational phrasing

pattern.[111] A number of researchers in fact have pointed out that focus generally relates fall-rise contours to the function of evoking a set of alternatives under consideration in the discourse (see Chafe 1976; Pierrehumbert and Beckman 1988; Partee 1991; Rooth 1992; Ladd 1996; among others). This observation holds for Japanese FNQ sentences.

Takami (1998) further claims that a floated quantifier can function as the secondary predicate for the theme; if the host NP cannot function as a topicalized element, the predication with the quantifier fails, leading to unacceptability of the sentence. Therefore, the host NP functions as a topic for both the FNQ and the VP. Relying on this association, Takami introduces the following constraint.[112]

(5.8)

Functionalist constraint on quantifier floating:

An NP in a sentence allows quantifier floating if it can function as a topic of the sentence. (Takami 1998: 93)

For instance, in (1.3), repeated here as (5.9), *tsukue o mochiageta,* "desk Acc lifted represents the primary predication and the quantifier *san-nin* 'three-Cl' the secondary predication. Hence, for the quantifier to function as the predicate, the host NP must be topical for the sentence in Takami's account.

[111] Such a default intonation phrasing is observed in VP-related FNQ sentences in the present account (see section 5.3).

[112] This constraint is exactly the opposite of Ohki's (1987) hypothesis in that Ohki claims that the host NP must be a potentially focal element. The current proposal stands in the middle ground: in FNQ sentences, theme and rheme (roughly, topic and focus) partition the utterance into constituents corresponding to (well-formed) information structure units.

(5.9) (=(1.3))

Gakusei ga (//) *go-nin* tsukue o mochiageta.

student Nom five-Cl desk Acc lifted

(i) 'Five (of the) students lifted a desk (individually).' **[Distributive]**

(ii) 'Five students lifted a desk (together)' **[Non-distributive]**

(cf. Nakanishi 2007, 2008)

However, the constraint 5.8 does not always work. As we already saw in section 2.5 (Chapter 2), there are a number of examples where the host NP serves as (part of) a comment rather than a topic in the discourse (see sections 5.3 and 5.4 below). Informationally, an FNQ phenomenon is a relation in which the FNQ does not always provide new information (or focus) about the host NP (contrary to Takami 1998 and Hatori 2002).

Focus no doubt plays a determining role in FNQ placement. It has been reported that, in many languages, the floated word order has been analyzed as a focus construction where the FNQ is in focus (for Korean quantifier float, see Hyun-Oak Kim 1982; Han 1999; for a possible connection between information structure and quantifier floating in Romance languages, see Belletti 2003). What we wish to emphasize, however, is that Japanese shows another focus effect, as can be seen in (2.5) in Chapter 2: When the subject is focused, the floated word order might be disfavored for some speakers but is still possible. See section 5.4 (Chapter 5) for a comprehension test using FNQ sentences.

As Yamamori (1999) discusses in some detail, in Takami's (1988) functional analysis, the possible distributional patterns of FNQs are not encoded syntactically in grammatical relations, and in his functional approach, (a) the host NP must be the topic of the sentence, and (b) the FNQ must appear in the focused position (see Hatori 2002 for a similar view).[113]

[113] According to Yamamori (1999), since Takami (1998) has no semantics/pragmatics of topic-focus structure, he fails to provide an account of the difference in meaning between ((i) a) and ((i) b) (cited from Yamamori 1999: 1023):

It must be noted, however, that the information structure of an FNQ sentence is ultimately determined on the basis of quantifier position (see section 4.1 (Chapter 4)). This indicates that, to contend that the host NP must be the topic, possible and impossible distributional patterns of FNQs must be predictable. However, an FNQ can appear in any pre-verbal position, as discussed in (2.5); Takami's account seems implausible owing to the unreliability of the claim that the FNQ must appear in the focused position. We will now turn to the prosodic aspects of FNQ constructions focused on in this study.

5.2 Prosody of FNQ constructions

5.2.1 Overview

On the assumption that prosody must be consistent with the information-structure roles (e.g., focus, topic, and background) imposed by context, this study is intended to show that the role of prosody and information structure cannot be ignored in syntactic research. Indeed, prosody needs to be assigned a major role. In this section, we examine in detail the role of prosody in the FNQ constructions.[114] In section 5.2.2, an outline of Japanese intonational phonology relevant to the FNQ construction is presented. The

---

(i) a. **Josei ga** paatii ni *san-nin* kita.
woman Nom party Dat three-Cl came
'Three women came to the party.' (As for women, only three women came.)
b. **Kimono o kita josei ga** *san-nin* kita.
kimono Acc wearing woman Nom three-Cl came
'Three women came to the party wearing kimono.'(Not only three women came. There were other women who came.)

In our view, in the FNQ construction the host NP could be viewed as a bare plural, interpreted either as just a property or as a quantified noun. Given this, the subject in ((i) a) is a bare noun that behaves as if it is property-denoting, but once it is modified as in ((i) b), it changes to a quantified NP, which can receive a focus (or contrastive focus) interpretation (see Kuhn 2001, and Chapter 4 for relevant discussion).

[114] The current study focuses on subject-related FNQs and examines their interpretive behaviors in prosodic terms. See Miyagawa and Arikawa (2007: Section 7) for a discussion of prosodic phrasings in subject-related and object-related FNQs.

present claim is that the position (and its accompanying interpretation) is determined by where the FNQ can prosodically combine with another element (e.g., subject noun, verb, etc.) without disrupting the prosody of the sentence, and NP-related FNQs appear in positions where such a prosodic incorporation is possible (cf. McClosky 2000, and Rochman 2005, 2010).

In the next section, 5.3, we will discuss in detail representations of prosody typically observed in two types of FNQ constructions that distinguish between the imports of syntax, which act on the formation of prosodic phrases, and those of information structure, which affect F0 register scaling. An experiment we conducted, reported in section 5.4, reveals how listeners solve prosodic ambiguities and, more specifically, how they comprehend phonological structures above the word level to mark discourse prominence in interaction with the information structure of the utterance in the appropriate context (cf. Selkirk 1995, 2000 and Ishihara 2007, 2011). The assumption will be confirmed that discourse-information influences interpretations by way of prosody.[115] We finally conclude in section 5.5 that information-structure representation influences the shape of intonational phrasings through the location and choice of prosodic prominence.

5.2.2 Intonation of Japanese

Prosody is generally understood as some combination of pitch, intensity, and timing. In the investigation of Japanese FNQ constructions, the most significant of these features is pitch movement or intonation. First, we will discuss some basic knowledge of intonation to be assumed in the discussion to follow.

Acoustically, linguistic intonational patterns consist of changes in the pitch of the voice, as produced at the vocal folds. Thus, contours of the

[115] One point to note is that, although we admit that prosody provides important indications of information structure, information-structure roles are often incompletely specified by prosody (see Dalrymple and Nikolaeva 2010, and section 5.3.3).

fundamental frequency (F0) of the voice serve as the phonetic representation of intonation. While an F0 contour is continuous, it is possible to identify it in distinct intonational "events," such as a peak of high pitch or a sharp fall in pitch (Liberman 1975, and Beckman and Pierrehumbert 1988). This allows for a phonological analysis of intonation contours as a sequence of distinct tonal entities. Tokyo Japanese employs a lexically-assigned pitch accent, with accentual phrases obligatorily accented or unaccented depending on the lexical content. Focus is conveyed by modifying this lexically determined pitch contour, so that words that follow the focused word exhibit attenuation of their lexically assigned pitch accent (for a detailed discussion, see Beckman and Pierrehumbert 1988; Kubozono 1993, 1995, 2007; Sugahara 2003; Ishihara 2007, 2011, among others).

There are two major questions with respect to intonational meaning: What are the meaningful units of intonation? What kinds of meanings are associated with these units? Domains of intonational patterns include tunes, phrasings, pitch accents, etc. According to Beckman and Pierrehumbert (1986) and Férry (1993), meaning types are associated with each domain.

(5.10)

a. Tune is often correlated with speech acts.
b. Phrasing is mostly associated with information structure.
c. Pitch accent is linked with the notion of focus.

Researchers including Beckman and Pierrehumbert (1988) and Selkirk (1986) assume that syntactic structure is mapped onto prosody as prosodic phrasing. Regarding prosodic phrases, it is standard to assume that an utterance may comprise one or more prosodic phrases called the "intonational phrase." Intonation phrase boundaries can generally be and sometimes are marked by a (nonhesitation) pause. They are often marked by a lengthening of the last syllable in the phrase. Beckman and Pierrehumbert (1986) and Selkirk (1986)

also assume a further relevant unit of prosodic phrasing in English, called the "intermediate phrase." An intonation, then, consists of a sequence of one or more intermediate phrases.

Intonation patterns consist of intonation features or subsystems of various kinds (Beckman and Pierrehumbert 1986). The terms *intonational contour* (or *tune*), *prominence* (or *stress*), *intonational phrasing*, and *pitch range* are used to refer to these features. The contour indicates the movement of pitch. For example, the intonation pattern of an assertion has a distinct contour from that of a question. Intonation phrasing divides the sequence of words into intonational phrases. Phrase boundaries are marked by pauses, boundary tones, and duration patterns. Pitch range controls the limits in which the contours are realized. Hence, variations in our pitch range mark to mark certain aspects of the organization of the discourse (Pierrehumbert 1980, and Pierrehumbert and Hirschberg 1990).

Pierrehumbert (1980) defines prominence as the combined effect of (i) the relative metrical strength of the syllable bearing the pitch accent and (ii) the amount of emphasis that the speaker wishes to give to the word or phrase containing the pitch accent (see (5.10)). In a language such as Japanese, more often than not, distinctive intonation is an important determinant of appropriate strategies to build up of the intended form of interpretation. It is generally agreed in the literature that F0 (fundamental frequency) tends to decrease over the course of an utterance (see Poser 1984, and Pierrehumbert and Beckman 1988).[116]

In Japanese, syntactically ambiguous strings of words can be distinguished by means of the prosodic phrasing, just as in English. In addition to word-internal constituents such as the syllable, Japanese also has larger constituents above the level of the word (in particular, various types of prosodic structures; see, e.g., Poser 1984; Kubozono 1993; among others).

[116] The fundamental frequency (F0) contour means the number of times per second that vocal folds complete a cycle of vibration (Clark and Yallop 1995: 332).

Prosodic structure might, at least in some cases, precede syntactic structuring. Prosodic and syntactic structures are, thus, not necessarily isomorphic (Jackendoff 1972; Selkirk 1984, 1995; Truckenbrodt 1999, 2007). Still, prosodic and syntactic structures often go hand in hand, but they can diverge to convey different aspects of the message (see Bolinger 1989: Chapter 3).

With these assumptions in mind, we will describe the two levels of prosodic phrasing that seem most relevant to intonational patterns of FNQ sentences.[117] One is the accentual phrase (AP), typically characterized by a rise to a high around the second mora and a subsequent gradual fall to a low at the right edge of the phrase. This delimitating tonal pattern is a marking of the prosodic grouping by itself, separate from the contribution of a pitch accent (Venditti 2005 and Kubozono 2007). The other is the intermediate phrase (IP), which consists of a string of one or more accentual phrases. Like accentual phrases, this level of phrasing is also defined both tonally and by the degree of perceived disjuncture within/between the groups. However, the tonal markings and the degree of disjuncture for the IP are different from those of the accentual phrase. The intonation phrase is the prosodic domain within which the speaker chooses a new range that is independent of the former specification.[118] Since there is also a process of downstep in Japanese, by which the local pitch height of each accentual phrase is reduced when following a lexically accented phrase, a (lowering) staircase-like effect of accentual phrase heights is often observed (see each contour in section 5.3.3).

Identifying two of the major prosodic factors in Tokyo Japanese (see Poser 1984; Pierrehumbert and Beckman 1988; Kubozono 1993, 2007; Ishihara

[117] Note that the intonation phrase (IP) is higher than the accentual phrase (AP) in the prosodic structure, and whenever a higher prosodic domain boundary is inserted, this separates the boundaries of the lower structures as well. On the Strict Layer Hypothesis by Selkirk 1986, each IP is exhaustively parsed into a sequence of APs, and the boundary of an IP coincides with the boundary of an AP, which, in turn, coincides with a word boundary.

[118] Intonation phrase boundaries can generally be and sometimes are marked by a (nonhesitation) pause. They are often marked by the lengthening of the last syllable in the phrase (see Beckman and Pierrehumbert 1988, and Kubozono 1993, 2007).

2007, 2011), we will elaborate on how they specify the distinct tones of two types of FNQs (discussed in the previous chapter).

First, Japanese has a rule of downstep (or catathesis), which applies iteratively at each lexical accent within some intermediate domain, and radically compresses F0 at each application (McCawley 1965; Poser 1984; Pierrehumbert and Beckman 1988; Selkirk and Tateishi 1991; Kubozono 1993, 2007; Ishihara 2007, 2011).[119, 120]

Second, pitch reset, the prominence of a new (focused) pitch accent, is a prosodic event at the beginning of each new intermediate phrase, whereby the pitch register is reset upward at the left edge of each new domain for the downstep.[121] As a result, F0 exhibits a moderate rebound from the downstep and declination every time a new domain boundary is encountered in the utterance.

It is not a settled issue that the F0 rise at a focused phrase is an instance of "pitch register reset." There are two lines of analyses for the prosodic effects induced by focus. One line of analysis claims that focus inserts a prosodic boundary on its left (hence induces a pitch register reset), and removes all the subsequent prosodic boundaries (hence induces a downstep) along the lines of Pierrehumbert and Beckman (1988). On the other a hand, there have been claims that the F0-rise at a focused phrase and the F0-reduction/compression after a focused phrase (so-called post-focal reduction) is independent of prosodic phrasing (Poser 1984). See Sugahara (2003), Kubozono (2007), and

[119] In Japanese, the trigger of a downstep is the HL lexical accent (see Kubozono 1993, 2007 for details).

[120] Major phrase (or intermediate phrase) is considered the phonological domain over which the downstep applies. In this connection, Poser (1984: 84) claims that "the topic phrase is generally set off from the rest of the sentence by a major phrase boundary, as indicated by the fact that it seems to have no effect on the following material" (104). Selkirk and Tateishi (1991) contend that Japanese has two levels of phrasing, i.e., major phrase and minor phrase, and that the former is characterized by downstep and the latter by initial lowering (see section 5.3.3 for details).

[121] One's pitch range expands when one speaks emphatically or speaks up to be heard above noise. Pitch range is partly determined by the shape and size of a speaker's larynx: men have lower pitch ranges than women and children do because of their longer, more massive vocal folds (see Kubozono 1993, 2007; Venditti 2006; Venditti et al. 2008 for further discussion).

Ishihara (2007, 2011) and others for relevant discussion. We adopt the former analysis in the discussion.

We are now ready to reexamine data concerning FNQs offered in the literature, taking into consideration the tonal events (e.g., downstep and pitch reset) of FNQ constructions. We will consider data involving FNQs with focus-affected interpretation (sections 5.3.3 and 5.3.4). Emphasis will be placed on the role of intonational grouping. The grouping of words into both accentual and intonation phrases (and the pitch range specification of those phrases as well) is dependent on an interaction of various factors such as word accentuation, syntactic branching structure, focus, discourse structure, attentional state, etc. (see Venditti 2006, and Venditti et al. 2008 for discussion).

5.3 Two types of FNQ intonation patterns

5.3.1 Intervention by pause and constituent length

In this section we address two types of FNQ intonation contours, reflecting a sort of cognitive organization similar to that reflected by syntactic integration, which have been overlooked in the literature. It argued that Japanese FNQs' prosody exhibits systematic integration: on the one hand, the intonation in a VP-related FNQ, as in 5.11b below, shows that the first phrase (i.e., the subject NP) ends with a terminal fall in pitch, and the second one (i.e., the FNQ) begins with a pitch reset, and the two phrases are separated by a substantial pause (visible in both the pitch trace and the waveform). On the other hand, the intonation in an NP-related FNQ, as in ((5.11) a) below, reflects the integration of the two phrases into a single prosodic structure, where the two phrases (i.e., the subject NP and FNQ) are integrated under one overall intonation contour (a regular decrease in pitch), with no full terminal fall until the end of the sentence. In these two types of intonation patterns, each prosodic

phrase presents focus/background information partitioning of its own in the sentence.

It has been suggested that NP-related FNQs may be deaccented because of reference to previous discourse/utterance just like pronouns (see section 4.2.7, Chapter 4). This interpretation appears to be more clearly dependent upon the (larger) context. Intonational patterns are generally used in a significant way to convey different contextual information, which may be expressed by a certain prosodic pattern. To illustrate the sensitivity of prosody to information structure, we consider a set of discourse settings pertaining to FNQ sentences in (5.11) below, involving an NP-related FNQ ((5.11) a) and a VP-related FNQ ((5.11) b), both of which reflect possible information structures.[122] It will be shown that pauses play an important role in Japanese syntactic processing (see Kiaer 2005 and references therein). To be more specific, the optional use of pauses in Japanese helps the parser to choose the intended phrase structure of the sentence.

We have already touched upon the fact that, in certain cases, FNQs can obtain more than one quantificational structure and derive interpretations that these structures are associated with (as we saw in section 4.2.8). The claim that both partitivity and distributivity play a role in FNQ interpretation is further corroborated by intonational-prosodic evidence. Let us consider the following example involving intervention by a pause, discussed in some detail as core data in Fujita (1994).

[122] Although we are aware that there are other phrasing patterns reflecting information structure, we will not deal with all of them for the sake of simplicity.

(5.11)

a. [**Soko ni** **iawáseta** **otokó ga** *rokú-nin*] // tero ni
there be-Past men Nom six-Cl terrorism in
makikom-are-ta.
involve-Pass-Past
'Six (and only six) men who happened to be there got involved in terrorism.'

b. [**Soko ni** **iawáseta** **otokó ga**] // [*rokú-nin*] tero ni
there be-Past men Nom six-Cl terrorism in
makikom-are-ta.
involve-Pass-Past
'Six (of the) men who happened to be there got involved in terrorism.'
(Fujita 1994:64)

Fujita's observation (and his theory based on it) seems insufficient for reasons described below. We will provide an alternative account, since, although pauses play an important role in Japanese syntactic processing, in some cases, their locations are sometimes unpredictable from the sentence structure.

In this connection, it is argued in Fodor (1995, 2002), for instance, that there are cases in which phonological length seems dominant in establishing implicit prosody. According to her, longer clauses carry a greater information load, which often makes them more likely to be associated with the main assertion of the sentence (hence focus). In light of this, we have to say that, in sentences ((5.11) a, b) the prosodic phrasings are not carefully controlled across conditions (e.g., syntactic or referential complexity). More specifically, in the long subject condition (here, the head with modifiers), we predict that the matrix subject will correspond to a single intonation phrase, marked by phrase-final lengthening (Hwang and Schafer 2009: 156). In (5.11), the 'neutral' prosodic phrasing pattern could show a downstep in pitch range on the

head noun (*otoko*), which cannot be explained by prosody alone.

In terms of sentence processing, the first boundary could attract special attention from the parser and be used to guide syntactic parsing.[123] The underlying assumption is that prosodic constituency reflects syntactic constituency where possible. A prosodic package is then assumed to form a single syntactic constituency by containing an XP (see Selkirk and Tateishi 1991; Truckenbrodt 1999, 2007, among others). However, in terms of prosodic constituency by virtue of the small-large (i.e., AP-IP in ((5.11) a)) or large-large (i.e., IP-IP in ((5.11) b)) relation between the two boundaries at (e.g., [[*soko ni iawaseta otoko ga*]$_{AP/IP}$ [*roku-nin*]]$_{IP}$ *tero ni atta*…) cannot guarantee that the first prosodic package reflects syntactic constituency (see section 5.3.2.2 for further discussion).[124]

As will be shown below, we take these differences as categorical (and hence phonological). That is, each pattern in the NP-related FNQ and VP-related FNQ constructions within a given speaker reflects prosodic representations that are distinct from one another. We will argue that the subject and the FNQ form a single intermediate phrase in the NP-related FNQ sentence, whereas they each form an intermediate phrase in the VP-related FNQ sentence. In this account, the initial sharp rise (pitch reset), thus, occurs in the VP-related FNQ sentence only (since this type of FNQ is always in focus) (Takami 1998).

In light of the distinctive pitch patterns displayed by FNQs, we will need to modify Fujita's examples in 5.11 by manipulating the subject length (i.e., pruning the modifier of the noun) since long subjects are almost always placed in separate intonation phrases, while short subjects are grouped into an intonation phrase with the following quantifier. The intonational patterns, to be

[123] However, the processing factor may not be the only factor influencing parsing. Various factors may be involved in comprehending uninformative prosodies. For instance, as discussed above, the length of a prosodic phrase may be one of the factors.
[124] Clifton et al. (2002), for instance, argues in terms of sentence processing that a prosodic package sometimes fails to reflect syntactic constituency.

discussed in the next subsection, will allow us to provide a prosodic account of the FNQ interpretation.

5.3.2 Examples with contexts

We have shown that the interpretation of FNQ constructions can be captured in prosodic terms by examining whether and how the raising and lowering of pitch accents is mediated by the effect of information structure on focus/non-focus domains. To see whether this analysis is correct or not, we will provide a detailed description of prosodic facts, employing a set of possible discourse settings using FNQ sentences, as provided in (5.12) and ((5.13) a-c) in light of (5.10). Below, in sections 5.3.2.1 and 5.3.2.2 (Chapter 5), sentences (5.12) and ((5.13) b) involve a VP-related FNQ and ((5.13) a, c) an NP-related FNQ. It will be shown that both intonational patterns reflect possible focus structures. Note that Figures 5.1-5.4 below show sample F0 contours, which are not affected by constituent length.

We will consider two kinds of focus: broad focus and narrow focus. It merits mention here that there is a descriptive generalization that is true of all the examples considered in this work. The primary stress of the sentence is always within the domain of the focused constituent (Chomsky 1971; Jackendoff 1972, 1997, 2007; Zubizaretta 1998; Steedman 2000a, b, 2012, among many others). In keeping with a long tradition, we rely on the *wh*-question/answer test for determining the focus structure of a sentence and regularly identify the focus on the basis of this test.[125]

There is also a wide variety of stress patterns and contexts in which the examples are acceptable, and in the FNQ construction, not all of them may

[125] The intricacies regarding the notion of "context" have consequences for grammaticality judgements involving different information structures. Speakers unintentionally attach a particular context to a given utterance. They could consider an utterance with a particular prosody as an appropriate response to the out-of-the-blue context question, "What happened?" in which the respective context is not truly out of the blue (see Fodor 2002; Kiaer 2005; Kitagawa and Fodor 2006, for more discussion).

require focus on the FNQ. As is well known from focus theory, what interpretations a particular focus assignment will pick out is strongly influenced by the information structure, particularly the question-answer structure in discourse (Jackendoff 1972, 1997, 2007; Kadmon and Roberts 1986; Rooth 1992; Roberts 1996; Kadmon 2001; Kahnemuyipour 2009).[126]

In a felicitous (i.e., coherent, natural, and appropriate) question-answer pair, the position of prosodic prominence in the answer (i.e., the target sentence) correlates with the questioned position in the question. If the information structure is relevant, the exact information in the context sentence strongly affects the prosodic realization of the answer sentence. It should be noted here that the contextual questions established below were provided in English, not Japanese, to the speaker. This is because, as Maekawa (1991) reports, the parser's judgment is frequently influenced by the F0 height of the question word, i.e., the focused *wh*-word.

5.3.2.1 Broad focus

Examination of speech indicates that FNQs are, in fact, often not new/asserted, and prosody does mark the difference in the existence of complex prosodic structures. Even when no particular item is focalized, a sentence seems to exhibit some specific prosodic pattern, reflecting its information structure.

In a broad focus case such as 5.12 below, where there is no single subconstituent that is focused but, rather, the whole domain, consisting of a single intonational phrase, and primary stress on the object is the result of the default sentential stress assignment (see Selkirk 1984, 1995; Pierrehumbert and Beckman 1988; Cinque 1993 for details).

Even in contexts where the whole clause is new/given, one element thus

[126] This casts some doubt on the concept "grammaticality on neutral focus" (see example (5.12), and Kadmon 2001: Chapter 13).

receives more prominence than the others, which is expected by the "default" sentential stress because it is quite common for reading or spontaneous speech, particularly in "wide-focus" or "out-of-the-blue" situations (Selkirk 1984, 1995; Schafer and Jun 2002; Kahnemuyipour 2009).[127] For the contextual factors, we employed a question context to establish a pattern of focus/non-focus information, which is a technique that is widely used in the theoretical literature (see, e.g., Vallduví 1992; Lambrecht 1994; Kadmon 2001; Van Valin 2005). For reasons of explication, relevant information structures are shown with added shading in the examples below. (In the glosses, Nlz stands for the nominalizer -*no*.)

(5.12) **Broad Focus**

Context: What happened?

Target:	**Seíjika ga**	*rokú-nin*	téro ni	makikomáreta-n-desu.
	politician Nom	six-Cl	terrorism in	got involved-Nlz-Cop
	[*Rheme* Focus			]

'Six (and only six) politicians got involved in terrorism.'

The pitch tracks, as shown in Figures 5.1-5.4 below, are based on tokens produced by a male Tokyo-Japanese speaker in his late thirties who is a researcher in natural language processing at a communication technology company. Every pitch-track diagram presented in Figures 5.1-5.4 was picked from three to four similar diagrams of the recordings. In the recording, the speaker was presented with the accompanying context, such as (5.12)-((5.13) a-c) and asked to read (aloud or silently) the context sentences. After reading

[127] With regard to sentential stress, Selkirk (1984, 1995) argues that the two rules apply differently, with interaction only in the final phonetic realization of the stress markings: sentential stress and focal stress (see Kahnemuyipour 2009 for a detailed discussion of the issue). Focus stress always takes precedence over sentential stress, and they are different in qualitative ways. Thus, for instance, primary stress determined by focus stress may be different from sentential stress in phonetic detail (see Kahnemuyipour 2009 for further discussion).

each context sentence and understanding it, the speaker produced each target sentence for the recording.

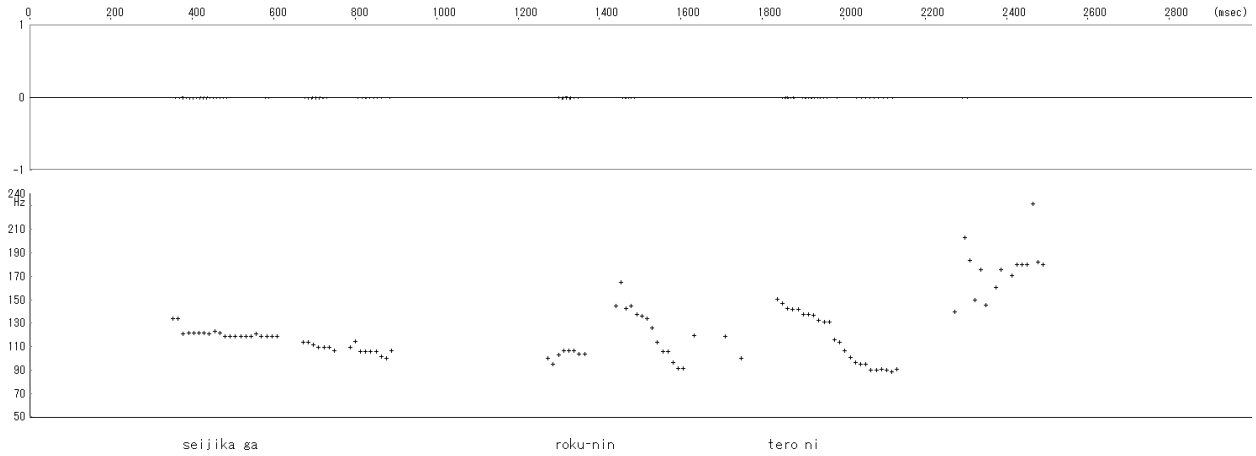


Figure 5.1. Pitch track of broad focus in (5.12)

In a broad-focus context, as is set by (5.12), the (default) sentence stress was found on the word left-adjacent to the verb (Selkirk and Tateishi 1991, and Shiobara 2004).[128] Japanese, hence, presumably makes use of default sentence stress, which is distinct independently of focus. It is important for the sake of discussion to distinguish between a prosodic phenomenon (e.g., pitch reset) and focus interpretation because it is not the case that they are always correlated (Lambrecht 1994, and Dalrymple and Nikolaeva 2010). Pitch reset may take place in the absence of focus because it also indicates the existence of a syntactic boundary (Selkirk and Tateishi 1991; Kubozono 1993, 2007; Ishihara 2011). The distinction between the prosodic phenomenon (pitch reset) and the semantic phenomenon (focus) should be made clear. We assume that it is the semantic/pragmatic effects of focus that are crucial for the interpretation of FNQs. For a comprehensive description of the relation between the

[128] Shiobara (2004) claims that a general prosodic property of Japanese is that prosodic prominence is relatively immobile in the language. However, as we will see below, there are certain cases in which Japanese allows for using extra prosodic prominence, which involves boosting of F0 as well as post-focal reduction (see Ishihara 2000, 2007, 2011, and references therein).

semantics of focus and its prosodic realization, see Truckenbrodt (1995: Chapters 4 and 5).

5.3.2.2 Narrow focus

For this particular contextual meaning in ((5.13) a), the two accent phrases were combined into a single intermediate phrase with the focus on the first accent phrase (i.e., subject). The intonation contour represented in Figure 5.2 below, unlike the one in Figures 5.1 or 5.3 below, reflects integration of the two phrases (or propositions) into a "single" prosodic structure (i.e., intonational grouping). Importantly, there is a steady fall in pitch from the beginning of the first phrase to the end of the second, with bumps on the stressed syllables at successively lower pitches. The first phrase (i.e., the subject noun) did not show a full terminal fall in pitch, but the slight rise in pitch on the final syllable of *roku-nin* "six-Cl" may simply indicate that more is to follow.

The second phrase (i.e., the FNQ) did not begin with a pitch reset, unlike in Figure 5.1. There was a regular decrease in pitch from one stressed syllable to the next, that is, from the stressed syllable of *seijika ga* 'politician Nom', to the stressed syllable *roku-nin* 'six-Cl'.

(5.13) **Narrow Focus (i)**

a. Context: I've heard that six people got involved in an accident. But what kind of accident?

Target: ?**Seíjika ga** *rokú-nin* // TÉRO ni makikomáreta-n-desu.
politician Nom six-Cl terrorism in got.involved-Nlz-Cop
[$_{Th}$ Focus Background] [$_{Rh}$ Focus Background]
'Six (and only six) politicians got involved in terrorism.'

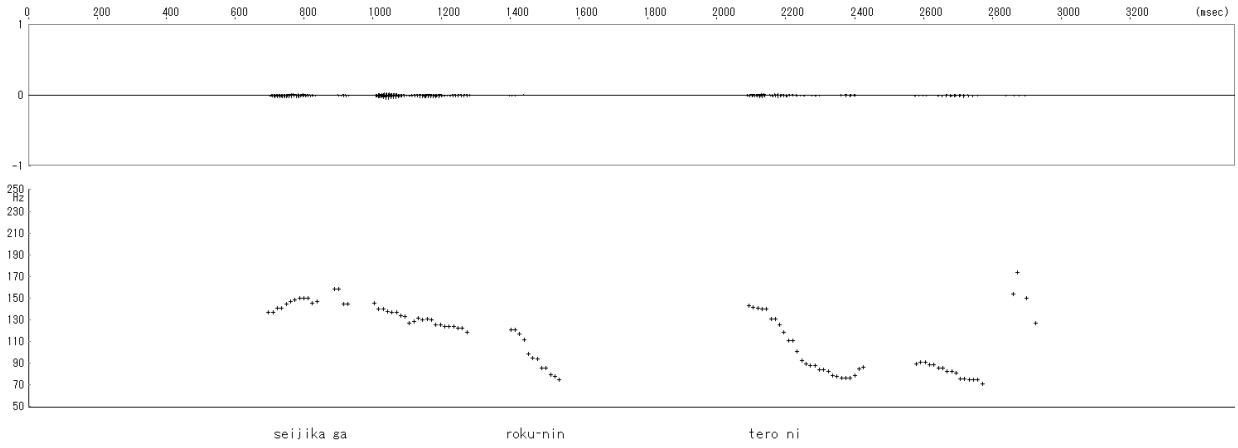


Figure 5.2. Pitch track of narrow focus in (5.13a)

It deserves discussion in passing that, in an answer to a question, what is already stated in the question is often not repeated because mentioning unnecessary information is sometimes a sign of clumsiness in a conversation unless the speaker has a special purpose in doing so (see Brown 1983). However, an example like ((5.13) a) tells us that an emphasis on not mentioning unnecessary material obviously does not exclude repetition or redundancy in conversation. In fact, repetition occurs frequently in spoken language. The subject may be just accidentally co-referent with the word *roku-nin* "six-Cl" in the context in ((5.13) a).

Following López (2009: 80), we here appeal to a Gricean maxim: *avoid repetition*. A "repeated" constituent is not the same as an anaphoric constituent; repetition is not necessarily a part of an anaphoric process (and an anaphor does not necessarily involve repeating); it might only be the result of accidental coreference.[129] We assume that the repetition of *roku-nin* in example ((5.13) a) is inevitable (at least for the speaker) if the subject is not

[129] This is why we do not call an NP-related FNQ simply an anaphoric use (see also section 4.2.7 (Chapter 4)). In terms of information structure roles, deaccented FNQs should be background, which is informationally old knowledge. If FNQs are deaccented and informationally new knowledge in the discourse, they are considered to be completive rather than background (see Butt and King 2000; Dalrymple and Nikolaeva 2010). In Butt and King's system, completive information (focus) is new to the addressee, but, unlike focus, it is not associated with the difference between pragmatic assertion and pragmatic presupposition.

omitted. Deaccenting the FNQ allows the speaker to at least partially comply with the maxim by simply weakening the repetition. Notice that deaccenting itself does not seem to be connected with the anaphoric property, a deaccented constituent is found in the previous discourse but is not necessarily anaphoric (which is considered not topic or focus but background or completive), unlike VP-related FNQs (which are focused) See section 4.2.4 (Chapter 4) for related discussion.

The prosodic pattern of ((5.13) a) (i.e., an NP-related FNQ) contrasts with that of ((5.13) b) (i.e., a VP-related FNQ) below, which consists of two independent phrases, each constituting a separate (independent) prosodic phrase. The first constituent ends with a terminal fall in pitch, the second begins with a pitch reset, and the two are clearly separated by a pause.

(5.13) **Narrow Focus (ii)**

b. Context: I've heard that some politicians got involved in terrorism. But how many?

Target: **Seíjika ga** // *ROKÚ-nin* téro ni makikomáreta n-desu.
politician Nom seven-Cl terrorism in got.involved.in Nlz-Cop
[$_{Th}$ Background] [$_{Rh}$ Focus Background ...]
'Six (and only six) politicians got involved in terrorism.'

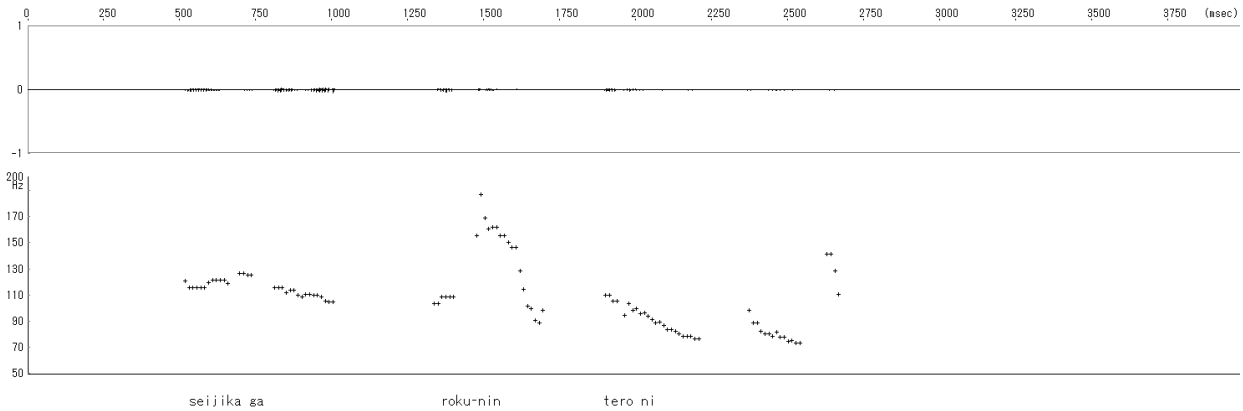


Figure 5.3. Pitch track of narrow focus in (5.13b)

What is important about ((5.13) b) and its pitch track (Figure 5.3) is that the second phrase *roku-nin* 'six-Cl' was significantly higher in pitch than the first phrase *seijika ga*. Focusing the second element implies treating it not only as a separate accent phrase (AP) but also as a separate intermediate phrase (IP) and an intonation phrase, too. Speakers would often pause at this boundary (see Pierrehumbert and Beckman 1988; Kubozono 1993, 2007; Ishihara 2007). In the contour shown in Figure 5.3, the second phrase began with a sharp pitch reset, up to the same high pitch as the beginning of the first sentence. It then ended with a similar final fall. Just as in the case of broad focus in (5.12), there were two bumps of high pitch on the two stressed syllables within the subject-FNQ string in ((5.13) b).

The overall pitch contours that we have seen so far may be criterial (see section 5.4 for further discussion). FNQ constructions are basically used to manipulate the flow of information through speech. Informationally, each prosodic phrase or intonation unit introduces just one significant new idea. It seems likely that different prosodic patterns are used to make pragmatic distinctions between theme and rheme. This can be functionally motivated by assuming that passage ((5.13) b) contains two asserted ideas, each presenting new information of its own. However, the two contrast in their prosodic structure. ((5.13) b) was pronounced as two distinct prosodic phrases, each with its own terminal fall in pitch and a pause between.

There is still another FNQ phrasing that shows more than simple integration. ((5.13) c) is such a case, which was pronounced under a single overall prosodic contour. The second phrase (i.e., FNQ) began with a partial pitch reset on the first stressed syllable, but this pitch was not as high as the initial pitch observed on the quantifier in ((5.13) b), similar to the contour of ((5.13) a).

(5.13) **Narrow Focus (iii)**

c. Context: I've heard that six people got involved in terrorism. But who was it that got involved in it?

Target: **SEÍJIKA ga** // *rokú-nin* téro ni makikomáreta-n-desu
politician Nom six-Cl terrorism in got involved-Nlz-Cop
[$_{Rh}$ Focus Background] [$_{Th}$ Focus …]
'Six (and only six) politicians got involved in terrorism.'

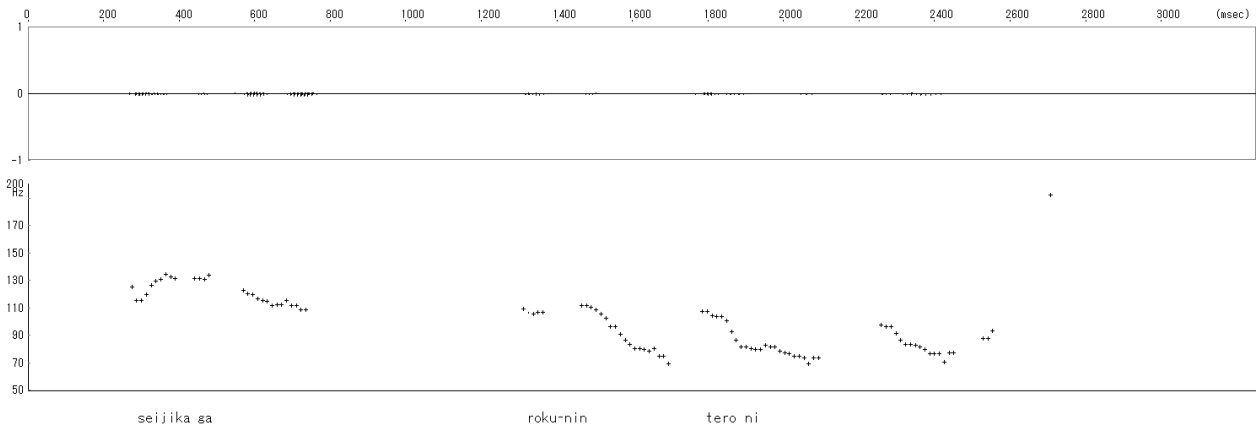


Figure 5.4. Pitch track of narrow focus in (5.13c)

In Figure 5.4, the pitch moved from a high at the beginning of the first phrase to a full terminal fall at the end of the second phrase in spite of the presence of a pause between the FNQ and its host NP (subject). In ((5.13) c), despite a pause that occurs immediately after the first phrase, the prosodic integration of this construction still appears clear. The initial phrase *seijika ga* did not end with a full terminal fall. The point to observe is that, in this contour, a new independent pitch range was not chosen before the FNQ; hence, the two items can be phrased together, consisting of a single intonational domain similar to the one we saw in ((5.13) a).[130]

To recapitulate, as observed in ((5.13) a-c) there are at least three distinct

[130] In Japanese, each prosodic phrase (intermediate phrase or major phrase) serves as a domain of the downstep between lexical pitch accents (Pierrehumbert and Beckman 1988; Kubozono 1993, 2007; Ishihara 2007, 2011; Féry and Ishihara 2009).

prosodic patterns with FNQs regarding narrow focus readings ((5.13)a-c). We here assume two relevant levels of prosodic boundary: accentual phrase (AP) and intermediate phrase (IP):

(5.14)

a.	[$_{IP}$ [$_{AP}$ **seijika ga** *roku-nin*]]	NP-related FNQ (e.g., ((5.13) a))
b.	[$_{IP}$ [$_{AP}$ **seijika ga**] [$_{AP}$ *roku-nin*]]	NP-related FNQ (e.g., ((5.13) c))
c.	[$_{IP}$ [$_{AP}$ **seijika ga**]] [$_{IP}$ [$_{AP}$ *roku-nin*]]	VP-related FNQ (e.g., ((5.13) b))

The prosodic analysis is compatible with the assumption that Japanese FNQs function either as NP-related in ((5.14) a, b), or as VP-related as in ((5.14) c). Concerning NP-related FNQs, the utterance in ((5.14) a) does not necessarily include a pause, so there is no separate boundary tone, whereas the one in ((5.14) b) does. The point is that the partition of the sentence in (5.14) into the verb phrase and a non-standard (but fully interpreted) constituent, [Subject NP, FNQ], corresponding to the string *seijika ga roku-nin*, makes this prosodic view structurally and semantically suited to the demands of intonational phrasing. It is highly likely that speakers might group the prosodic words for the NP-related FNQ in each utterance into two APs, as in ((5.14) b), which, in turn, were grouped together to form a single IP for the utterance as a whole, as in ((5.14) a). In contrast, for the utterance involving VP-related FNQs, the tone structure looks like ((5.14) c). (We will report in the next section on an experiment carried out to determine what prosodic structures can distinguish between distributive and non-distributive FNQ readings.)

We have found that intonation helps to determine which of the multiple possible phrasings (as illustrated in (5.14)) is permitted by the (combinatory) syntax of Japanese and that the interpretations of the constituents that arise from these derivations are related to distinctions of the information structure: discourse focus among the topics that the speaker has in mind and the comments that the speaker has to contribute to, etc. (see Steedman 2000b:

Chapter 5). These facts make a CCG formalism sensitive to the presence of intonational boundaries (i.e., when intonational boundaries are present, they coincide with syntactic boundaries and other tonal events) (see Chapter 6 for an analysis).

5.3.2.3 Summary and predictions

As pointed out in 5.3.1, what is lacking in Fujita's (1994) observation (and his theory) is that there is another intonational (and interpretational) pattern in the FNQ construction like the one we saw in ((5.13) a) with Figure 5.2 and ((5.13) c) with Figure 5.4 that can induce a non-partitive reading, in which a prosodic break is placed right after the subject, followed by a deaccented FNQ.[131] This configuration cannot be ignored or set aside as exceptional.

In the present analysis, the two distinct interpretations (e.g., NP-related and VP-related FNQ sentences) can be distinguished prosodically by the relative height of the first two peaks, that is to say, by the choice of pitch range on the subject noun and the FNQ.

In ((5.13) c) there is a pause coinciding with the intermediate phrase boundary, as shown in Figure 5.4. However, this (long) pause is not necessary for this pitch pattern to generate an NP-related FNQ reading (see Figure 5.2). Despite the presence of the pause, ((5.13) c) can be interpreted as an NP-related FNQ. It may be said that the syntax is overridden by the prosody in this FNQ sentence (cf. Selkirk and Tateishi 1991). It is expected that the maximal projection in syntax influences (and coincides with) the prosody at the level of the intermediate phrase (and the intonational phrase as well), not the accentual phrase. Hence, when we consider ((5.13) a) and ((5.13) c), compared with ((5.13) b), we can say that it is the fundamental frequency contour (F0)

[131] We will argue in Chapter 6 that a flexible syntax such as CCG enables us to accommodate without difficulty multiple realizations of FNQs, as represented in Figures 5.1-5.4 above.

(rather than the presence/absence of a pause) that is the more salient cue to the syntactic structure in distinguishing between the two types of FNQs.

Prior approaches to Japanese FNQ constructions cannot explain the difference in intonation and interpretation between ((5.13) b) and ((5.13) c). The data presented in ((5.13) c) with Figure 5.4 clearly indicate that a prosodic boundary inserted at the syntactic boundary and the F0 boosting triggered by focus behave differently (compared with Figure 5.3).[132] We would need a more elaborate model than the insertion and deletion of prosodic phrases if we are to explain the information-structural effects on FNQ prosody.

Keeping in mind that the FNQ phenomenon is considered to be a result of the influence of (at least) three distinctive general forces, structural, discourse-pragmatic, and intonational forces, we predict that the intonational contour resulting from these variations provides listeners with cues to the syntactic structure and the information structure (see Venditti 2006; Venditti et al. 2006 for related discussion). Since the relevance of prosody to acceptability has not previously been broadly tested concerning FNQ constructions, we conducted a comprehension test on the two types of FNQ sentences that we will report on in the next section.

5.4 Experiment (comprehension test)

5.4.1 Design

To check objectively the way Japanese speakers comprehend FNQ sentences, we examined whether listeners make use of prosodic effects in the assignment of sentence meanings (in particular, distributive and non-distributive readings). More specifically, a comprehension test was used to

[132] Kubozono (1993, 1995, 2007) points out that there is an alternative account available because the reset at the beginning of the focus constituent is potentially ambiguous: it could signal the start of a new IP, or it may be a more local boost that raises the top line of the current AP only, without affecting the prosodic organization of the utterance at the IP level (see Venditti 2006, and Venditti et al. 2008 for further discussion).

evaluate the assumption that the two types of FNQ sentences are intonationally and interpretationally distinguishable. In this test, prosodic cues to syntactic structure were produced by the speaker, and there was no contextual information available that could be used to restrict the possible interpretations to the correct one. It was hypothesized that in the absence of contextual information that could be used for resolving ambiguity, listeners would make use of prosodic information in order to facilitate comprehension.

According to Kitagawa and Fodor (2006), there is a fine line between cases in which a prosodic contour helps a listener arrive at the intended syntactic analysis, and cases in which a particular prosodic contour is obligatory for the syntactic construction in question. The examples considered in the experiment were of the former type. The test materials are given in (5.15) below. Even though the test sentences in each pair have different prosodic and syntactic structures, their surface word order is identical, consequently resulting in syntactic ambiguity.

5.4.2 Material and procedure

We provided two prosodic conditions in the auditory listening experiment, without disambiguating contexts. In each pair, the a-sentence represents the "VP-attached" condition and the b-sentence represents "the NP-attached" condition. As already defined in Chapter 2, the former (equivalent to the VP-related FNQ) is characterized as describing multiple events (hence distributive), while the latter (equivalent to the NP-related FNQ) is characterized as denoting a single event (hence non-distributive). A total of 12 paired test sentences were used ((T1a, b)-(T12a, b) in (5.15)).

The participants were 33 native speakers of Japanese (22 undergraduate and 11 graduate students at the College of Industrial Technology, Nihon University). The test material for the auditory experiment was developed in the following manner. Example sentences from previous studies by Fujita (1994),

Gunji and Hasida (1998), Kobuchi (2003, 2007), Nakanishi (2004, 2007, 2008) were used as test sentences; some of them were slightly modified to fit the purpose of the current experiment. The recording was carried out in the following manner: the target sentences were recorded by a colleague of the author, a male native speaker of Tokyo Japanese in his late thirties. All the test sentences were recorded and saved in .wav format in a Sugi Speech Analyzer (ANIMO, Fujitsu) (see Appendix A for each intonational contour). The recording was made without the speaker being told that the sentences were prosodically and syntactically ambiguous, and no indication was given of the location and type of prosodic breaks. In recording, the speaker was allowed to make a conscious effort to disambiguate the meanings between ① and ②, as indicated in (5.15).[133] After reading (either aloud or quietly) and understanding the entire set of stimuli, the speaker was asked to read aloud each target sentence in two different versions which he thought reflected ① and ②. The speaker was allowed to do this repeatedly until he was satisfied with the result, and this final version was used as the recording in the comprehension test. The target sentences in (5.15) consisted of the different possible patterns for FNQ sentences. (The contours of the target sentences were largely consistent with those found in section 5.3, though the speakers were different).

The stimuli were separated into two groups and tested in two separate sessions. The two groups consisted of (T1-6) and (T7-12), respectively. The

[133] One thing remaining unclear is *how* the test insured that all experimental stimuli were produced with the intended prosody. An experiment of this kind may be insufficient in some ways. For instance, it appears difficult to examine how speakers produce various FNQ sentences: Sentences would be produced differently even under the relevant pragmatic conditions carefully controlled (see Cowart 1997: Chapter 5 for related discussion). This is mainly due to the fact that information-structure roles are known to be often incompletely specified by prosody, whereas prosody clearly does, in many cases, provide important indications of information structure (see Butt and King 2000, and Dalrymple and Nikolaeva 2010 for details). Even so, our comprehension test would still lend some support to the assumption that VP-related FNQs and NP-related FNQs are intonationally distinguished from one another in Japanese. The two structures are in fact decoded to a great degree; thus, listeners do, in large part, obtain the contextually appropriate interpretation only from the particular prosody.

two sessions were conducted in a mid-sized classroom with a five-minute interval between the sessions. Each target sentence was presented twice and the participants were asked to answer a question about each sentence immediately after hearing it. The questions had been written on the test sheet. Participants were given 7 seconds to reply to each question. Based on the understanding of the meaning of each target sentence, participants were asked to choose one of the two meanings (i.e., ① or ②) that had been written on the test sheet (see Appendix B). In choosing, participants were allowed to repeat the example to themselves silently if they wished. In (5.15), the numbers within the boxes represent the native speakers' judgments (① or ②) on a given FNQ interpretation indicated in square brackets [ ].

(5.15) Target sentences (T1-T12):

(T 1)

a. 女の子が昨日 // ６人ボートに乗った。

Onnanoko ga kinoo // roku-nin booto ni notta.

girl(s) Nom yesterday six-Cl boat got.on

[①６人がいっしょに乗った ②６人がそれぞれ別々に乗った] 10, 23

They took the boat together. They took the boat individually.

b. 女の子が昨日６人 // ボートに乗った。

Onnanoko ga kinoo *roku-nin* // booto ni notta.

girl Nom yesterday six-Cl boat got.on

[①６人がいっしょに乗った ②６人がそれぞれ別々に乗った] 22, 11

They took the boat together. Each of them took the boat individually.

(T 2)

a. 女の子が昨日 // ６人おもちゃのボートを作った。

Onnanoko ga kinoo // *roku-nin* omocha no booto o tsukutta.

girl Nom yesterday six-Cl toy Gen boat Acc made

[①６人がいっしょに作った　②６人がそれぞれ別々に作った] 9, 24

They made a toy boat together.　Each of them made a toy boat individually.

b. 女の子が昨日６人 // おもちゃのボートを作った。

Onnanoko ga kinoo *roku-nin* // omocha no booto o tsukutta.

girl Nom yesterday six-Cl toy Gen boat Acc made

[①６人がいっしょに作った　②６人がそれぞれ別々に作った] 10, 23

They made a toy boat together.　Each of them made a toy boat individually.

(T 3)

a. 女の子が昨日 // ３人椅子を壊した。

Onnanoko ga kinoo // *san-nin* isu o kowashita .

girl Nom yesterday three-Cl chair Acc broke

[①３人がいっしょに壊した　②３人がそれぞれ別々に壊した] 9, 24

They broke a chair together.　Each of them broke a chair individually.

b. 女の子が昨日３人 // 椅子を壊した。

Onnanoko ga kinoo *san-nin* // isu o kowashita .

girl Nom yesterday three-Cl chair Acc broke

[①３人がいっしょに壊した　②３人がそれぞれ別々に壊した] 21, 12

They broke a chair together.　Each of them broke a chair individually.

(T 4)

a. 男の子が昨日 // ６人そのボートに乗った。

Otokonoko ga kinoo // *roku-nin* sono booto ni notta.

boy Nom yesterday six-Cl the boat got.on

[①６人がいっしょに乗った　②６人がそれぞれ別々に乗った] 13, 20

They got on the boat together.　Each of them got on the boat individually.

b. 男の子が昨日６人 // そのボートに乗った。

Otokonoko ga kinoo *roku-nin* // sono booto ni notta.

boy Nom yesterday six-Cl the boat got.on

[①６人がいっしょに乗った ②６人がそれぞれ別々に乗った] 25, 8

They got on the boat together. Each of them got on the boat individually.

(T 5)

a. 男の子が昨日 // ６人そのおもちゃのボートを作った。

Otokonoko ga kinoo // *roku-nin* sono omocha no booto o tsukutta.

boy Nom yesterday six-Cl the toy Gen boat Acc made

[①６人がいっしょに作った ②６人がそれぞれ別々に作った] 12, 21

They made the toy boat together. Each of them made the toy boat individually.

b. 男の子が昨日６人 // そのおもちゃのボートを作った。

Otokonoko ga kinoo *roku-nin* // sono omocha no booto o tsukutta.

boy Nom yesterday six-Cl the toy Gen boat Acc made

[①６人がいっしょに作った ②６人がそれぞれ別々に作った] 15, 18

They made the toy boat together. Each of them made the toy boat individually.

(T 6)

a. 男の子が昨日 // ３人その椅子を壊した。

Otokonoko ga kinoo // *san-nin* sono isu o kowashita .

boy Nom yesterday three-Cl the chair Acc broke

[①３人がいっしょに壊した ②３人がそれぞれ別々に壊した] 16, 17

They broke the chair together. Each of them broke the chair individually.

b. 男の子が昨日３人 // その椅子を壊した。

Otokonoko ga kinoo *san-nin* // sono isu o kowashita .

boy Nom yesterday three-Cl the chair Acc broke

[①３人がいっしょに壊した ②３人がそれぞれ別々に壊した] 29, 4

They broke the chair together. Each of them broke the chair individually.

(T 7)

a. 子どもが昨日 // ３人犬にエサをあげた。

Kodomo ga kinoo // *san-nin* inu ni esa o ageta.

child Nom yesterday three-Cl dog to food Accgave

[①３人がいっしょにあげた ②３人がそれぞれ別々にあげた] 2, 31

They fed a dog together. Each of them fed a dog individually.

b. 子どもが昨日３人 // 犬にエサをあげた。

Kodomo ga kinoo *san-nin* // inu ni esa o ageta.

child Nom yesterday three-Cl dog to food Acc gave

[①３人がいっしょにあげた ②３人がそれぞれ別々にあげた] 15, 18

They fed a dog together. Each of them fed a dog individually.

(T 8)

a. 子どもが昨日 // ３人その犬を殺した。

Kodomo ga kinoo // *san-nin* sono inu o koroshita.

child Nom yesterday three-Cl the dog Acc killed

[①３人がいっしょに殺した ②３人がそれぞれ別々に殺した] 21, 12

They killed the dog together. Each of them killed the dog individually.

b. 子どもが昨日３人 // その犬を殺した。

Kodomo ga kinoo *san-nin* // sono inu o koroshita.

child Nom yesterday three-Cl the dog Acc killed

[①３人がいっしょに殺した ②３人がそれぞれ別々に殺した] 28, 5

They killed the dog together. Each of them killed the dog individually.

(T 9)

a. 子どもが昨日 // ６人犬の頭をなでた。

Kodomo ga kinoo // *roku-nin* inu no atama o nadeta.

child Nom yesterday six-Cl dog Gen head Acc stroked

[①６人がいっしょになでた ②６人がそれぞれ別々になでた] 5, 28

They stroked a dog’s head together. Each of them stroked a dog’s head individually.

b. 子どもが昨日６人 // 犬の頭をなでた。

Kodomo ga kinoo *roku-nin* // inu no atama o nadeta.

child Nom yesterday six-Cl dog Gen head Acc stroked

[①６人がいっしょになでた ②６人がそれぞれ別々になでた] 9, 24

They stroked a dog's head together. Each of them stroked a dog's head individually.

(T 10)

a. おとなが昨日 // ３人その犬にエサをあげた。

Otona ga kinoo // *san-nin* sono inu ni esa o ageta.

adult Nom yesterday three-Cl the dog to food Acc gave

[①３人がいっしょにあげた ②３人がそれぞれ別々にあげた] 9, 24

They fed the dog together. Each of them fed the dog individually.

b. おとなが昨日３人 // その犬にエサをあげた。

Otona ga kinoo *san-nin* // sono inu ni esa o ageta.

adult Nom yesterday three-Cl the dog to food Acc gave

[①３人がいっしょにあげた ②３人がそれぞれ別々にあげた] 22, 11

They fed the dog together. Each of them fed the dog individually.

(T 11)

a. おとなが昨日 // ３人犬を殺した。

Otona ga kinoo // *san-nin* inu o koroshita.

adult Nom yesterday three-Cl dog Acc killed

[①３人がいっしょに殺した ②３人がそれぞれ別々に殺した] 5, 28

They killed a dog together. Each of them killed a dog individually.

b. おとなが昨日３人 // 犬を殺した。

Otona ga kinoo *san-nin* // inu o koroshita.

adult Nom yesterday three-Cl dog Acc killed

[①３人がいっしょに殺した ②３人がそれぞれ別々に殺した] 19, 14

They killed a dog together. Each of them killed a dog individually.

(T 12)

a. おとなが昨日 // ６人その犬の頭をなでた。

Otona ga kinoo // *roku-nin* sono inu no atama o nadeta.

adult Nom yesterday six-Cl the dog Gen head Acc stroked

[①６人がいっしょになでた ②６人がそれぞれ別々になでた] 4, 29

They stroked the dog's head together. Each of them stroked the dog's head individually.

b. おとなが昨日６人 // その犬の頭をなでた。

Otona ga kinoo *roku-nin* // sono inu no atama o nadeta.

adult Nom yesterday six-Cl the dog Gen head Acc stroked

[①６人がいっしょになでた ②６人がそれぞれ別々になでた] 11, 22

They stroked the dog's head together. Each of them stroked the dog's head individually.

5.4.3 Results

A chi-square test (for independence) was performed with Excel 2010 for each test sentence in (5.15). The result for each target pair is presented in Figure 5.5 below. Differences are considered statistically significant when $p < 0.05$. On this criterion, the results for sentences (T1), (T3), (T4), (T6), (T7), (T8), (T10), (T11) were significant, whereas those for (T2), (T5), (T9), (T12) were not. Regarding the former, we can draw the conclusion that listeners were able to identify two distinct meanings based only on assigned prosody. As for the latter sentences, we will comment on these in a moment; we point out here that they do not affect the current argument.

Figure 5.5. Results of chi-square test for each pair of sentences

T1 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	10	23	33
NP-attached	22	11	33
Total	32	34	66

Expected	NON-DIST	DIST
VP-attached	16	17
NP-attached	16	17

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
8.73529412	1	0.0031211	**

Cramer-V	0.3638034
Yule-Q	-0.642857

T2 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	9	24	33
NP-attached	10	23	33
Total	19	47	66

Expected	NON-DIST	DIST
VP-attached	9.5	23.5
NP-attached	9.5	23.5

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
0.07390817	1	0.7857292	

Cramer-V	0.0334637
Yule-Q	-0.073826

T3 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	9	24	33
NP-attached	21	12	33
Total	30	36	66

Expected	NON-DIST	DIST
VP-attached	15	18
NP-attached	15	18

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
8.8	1	0.0030123	**

Cramer-V	0.3651484
Yule-Q	-0.647059

T4 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	10	23	33
NP-attached	22	11	33
Total	32	34	66

Expected	NON-DIST	DIST
VP-attached	16	17
NP-attached	16	17

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
8.73529412	1	0.0031211	**

Cramer-V	0.3638034
Yule-Q	-0.642857

T5 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	13	20	33
NP-attached	18	15	33
Total	31	35	66

Expected	NON-DIST	DIST
VP-attached	15.5	17.5
NP-attached	15.5	17.5

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
1.52073733	1	0.2175079	

Cramer-V	0.1517942
Yule-Q	-0.297297

T6 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	16	17	33
NP-attached	28	5	33
Total	44	22	66

Expected	NON-DIST	DIST
VP-attached	22	11
NP-attached	22	11

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
9.81818182	1	0.001728	**

Cramer-V	0.3856946
Yule-Q	-0.71223

T7 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	4	29	33
NP-attached	15	18	33
Total	19	47	66

Expected	NON-DIST	DIST
VP-attached	9.500	23.500
NP-attached	9.500	23.500

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
8.9429	1	0.0028	**

Cramer-V	0.3681
Yule-Q	-0.7160

T8 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	19	14	33
NP-attached	28	5	33
Total	47	19	66

Expected	NON-DIST	DIST
VP-attached	23.500	9.500
NP-attached	23.500	9.500

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
5.9866	1	0.0144	*

Cramer-V	0.3012
Yule-Q	-0.6099

T9 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	4	29	33
NP-attached	10	23	33
Total	14	52	66

Expected	NON-DIST	DIST
VP-attached	7.000	26.000
NP-attached	7.000	26.000

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
3.2637	1	0.0708	

Cramer-V	0.2224
Yule-Q	-0.5183

T10 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	11	22	33
NP-attached	26	7	33
Total	37	29	66

Expected	NON-DIST	DIST
VP-attached	18.500	14.500
NP-attached	18.500	14.500

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
13.8397	1	0.0002	**

Cramer-V	0.4579
Yule-Q	-0.7627

T11 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	7	26	33
NP-attached	18	15	33
Total	25	41	66

Expected	NON-DIST	DIST
VP-attached	12.500	20.500
NP-attached	12.500	20.500

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
7.7912	1	0.0053	**

Cramer-V	0.3436
Yule-Q	-0.6335

T12 Chi square Test Result

Observed	NON-DIST	DIST	Total
VP-attached	6	27	33
NP-attached	11	22	33
Total	17	49	66

Expected	NON-DIST	DIST
VP-attached	8.500	24.500
NP-attached	8.500	24.500

Chi square Test **:p<.01 *:p<.05

χ^2	F	P-value	Result
1.9808	1	0.1593	

Cramer-V	0.1732
Yule-Q	-0.3846

As can be seen in Figure 5.5, there is no statistically significant difference between NP-attached and VP-attached readings in (T2), (T5), (T9), and (T12). In (T2b), there is a good possibility that not a few participants took the object noun *omocha no booto* 'a toy boat' as something like a normal plastic model of a boat, which is usually not high-priced. So it was hard to imagine a large-sized model (in the real world) that looks hard for a girl to make by herself. In (T9b), *naderu* 'stroke' is a verb that commonly induces distributive interpretation, which would make it difficult to obtain a non-distributive reading (in an appropriate context). Interestingly, this sentence is in sharp contrast to (T8b) where the verb *korosu* 'kill' is typically used as an only-once predicate, hence yielding a single event (see Chapter 4). In sentences (T5b) and (T12b), the object noun is definite as it is preceded by *sono* 'the/that'. It seems likely that some participants took *sono* as, for instance, part of *sono shurui no* 'the same type/kind of', which may have been forced by distributivity and more tightly associated with the VP-attached phrasing (as can be seen in the a-sentence). Note that this sort of reading was possible due to the particular lexical nature of *sono*.

The result of Chi-square test (Figure 5.5) confirm the observation that speakers perceive syntactic difference in terms of prosodic structure that is assumed in this study to be closely related to information structure. The result showed that even though listeners could in general evaluate both meanings of the ambiguous strings, the availability of two interpretations was not consistent across the two prosodic renditions of the same sentence.

5.4.4 Discussion

We have seen in the comprehension experiment that a clear distinction can be drawn between NP-related FNQs and VP-related FNQs. The test results provide support for the claim that prosody plays a vital role in the interpretation of FNQ sentences. The results seem consistent with the

observation in the study by Kitagawa and Fodor (2006), who argue that the prosody of a sentence (greatly) influences speakers' comprehension. From our comprehension test, we can make an important observation: when there was a prosodic boundary in a location other than before the FNQ phrase, listeners would feel the NP-attached reading (associated with a non-distributive reading) to be more preferable. In contrast, when there was a prosodic boundary before the FNQ phrase, listeners would consider the NP attachment reading to be less favorable. This is presumably because the presence of the (biggest) prosodic break right before the FNQ, which is ambiguous between distributive and non-distributive readings, seems to prohibit the attachment of the FNQ to the preceding NP (i.e., the subject), resulting in a VP attachment reading.

From the above observation, we found that the presence of the IP boundary before the FNQ effectively biased listeners toward the syntactically preferred VP-attached interpretation.[134] In this condition, listeners would judge the VP-attached interpretation as very acceptable and would prefer the VP-attached version.[135]

By way of illustration, let us consider cases where listeners showed a (slight) preference for the NP-attached reading of ambiguous FNQ sentences as expected (see, e.g., b-sentences in (T1), (T3), (T4), (T6), (T8), (T10), (T11)).

---

[134] Venditti (2006) and Venditti et al. (2008) reported that the duration of the nominative marker *ga* and the dative marker *-ni* were significantly longer only when they immediately preceded a syntactic clausal boundary. The syntactic boundary was also marked by an inserted silent duration. F0 analyses showed no downstep on the words that began a new clause, indicating the beginning of a new higher-level phrase (an intermediate phrase, in their terms). These results showed that speakers of Japanese marked a syntactic clause boundary prosodically by lengthening the last syllables at the boundary and also by resetting the pitch level for a new syntactic clause. These points were not always found in the pre-recorded sentences in (5.15) (see Appendix A).

[135] This implies that the NP-attached reading may not be encountered very often in written sentences. When overt prosody is present, listeners may favor the syntactic structure consistent with the prosody (most familiar to the listener) and judge the sentence accordingly. When no overt prosody is provided, as in reading, readers may proceed as if the mentally manifested prosody had been part of the input and then judge the syntactic well-formedness of the sentence on that basis (Fodor 2002). Therefore, any sentence (including ambiguous FNQ sentence patterns) whose required prosodic contour might not conform to general prosodic patterns in the language (i.e., the default sentence stress) would be in danger of being ungrammatical even if spoken with the appropriate prosody (see Fodor 2002, and Kitagawa and Fodor 2006 for further discussion).

One possible reason for this NP-attachment preference may be the lack of a (long) pause before the FNQ in the target sentences. This is the case because, unlike written text, in speech text, an NP-attached reading is typically signaled by the absence of pitch reset and the presence of a pause immediately after the FNQ phrase (as discussed in section 5.3). This was, in fact, observed for the b-sentences of (5.15), where a pause was placed right after the FNQ. Without the pause, the listeners tended to select a VP attachment if there were no pragmatic requirements. Recall that our main interest is the relative F0 peak height (rather than the presence of a prosodic break) between the subject and the FNQ because it should provide information about the (syntactic) phrasal level assigned to the FNQ with respect to the preceding noun (i.e., the subject) (see 5.3.2.3).[136]

In light of the above discussion, we can now see how the dependence on the presence of "default" VP-related FNQ reading (widely observed in previous studies) makes an incorrect prediction regarding the b-sentences in the material, where NP-related readings (non-distributive readings) are certainly available. For instance, in the case of ((T6) a) and ((T8) a), when the prosody is biased toward the (apparently) less-preferred interpretation (here, the NP-attached reading). In other words, listeners took the NP-attached reading as more preferable than the VP-attached, given the (major) prosodic boundary before the FNQ. They would still find the NP-attached reading fairly acceptable.

In view of these points, the test results should come as no surprise. The FNQ's position is determined by where the FNQ is prosodically incorporated into either the (subject) NP or the VP without disrupting the prosodic phrase of the utterance by F0 boosting (or pitch reset) (as discussed in section 5.3). Most importantly, this means that, in NP-attached readings, listeners still attached

[136] From the viewpoint of sentence processing, Price et al. (1991) conducted analyses of prosodic breaks and pitch prominences. Prosodic breaks assumed a more important role, and often, they were the only cue available to resolve syntactic ambiguity. Pitch prominence seemed to play a supporting role, but this is not always the case in Japanese, as we saw in the pitch contour of Figure 5.4 (see also Féry and Ishihara 2009, and Ishihara 2011 for a similar account).

the post-focal material (FNQs) into the constituent containing the immediately preceding lexical head (i.e., subject).[137] This constitutes evidence against the hypothesis that assigning extra prosodic prominence (e.g., focal stress) to the focus does not improve the sentence (see Shiobara 2004 for such a view).[138] The results tell us that, even if structural considerations were to play a role in resolving the syntactic (or bracketing) ambiguity, they can be overridden by the right combination of prosodic and discourse information. We emphasize that prosodic manipulation of tonal events could save such seemingly infelicitous meanings of FNQ sentences, as exemplified in distinct prosody in the intonational patterns of (5.15) (see Appendix A). This is possible because the listeners were able to decode prosodic cues that the speakers encoded, and obtain the contextually appropriate interpretation.

The two conditions were found to induce two distinct meanings in this experiment: VP-attached and NP-attached readings. How, then, can we relate this finding to the phonological representation? As previously discussed in section 5.3, a plausible answer is that there is an AP-boundary between the subject and the FNQ in the NP-attached condition and an IP-boundary in the VP-attached condition. Phonologically, the IP and AP distinction is enough to describe the prosodic difference between VP-related FNQs and NP-related FNQs (see (5.14)). According to these categorical differences, the patterns in the two conditions reflect distinct prosodic representations.

The result of our experiment also indicates that it is presumably the prosodic structure that provides cues to the first stage in the analysis of incoming speech.[139] This is not to say that syntax is not relevant in the first

[137] According to Pierrehumbert and Beckman (1986) and Jun (1993), focus sets off a word from a preceding phrase, creates a phrase boundary between the focused word and the preceding word, and dephrases the words following it until a new focused word is reached.

[138] This indicates that listeners interpret FNQ sentences in the written mode to have more VP-attached readings, but this is not true when the sentences are given in spoken mode, as we saw in the comprehension test.

[139] It was first suggested by Selkirk (1978) and further argued by Nespor and Vogel (1983) on the basis of perception data that it is not syntactic constituents but, rather, prosodic constituents that provide the relevant information in the first stage of processing

stage of processing in speech perception; rather, it is only indirectly relevant for marking information structure in interpretation since syntactic information is referred to in the construction of the various prosodic constituents above the word level (e.g., AP and IP). Thus, the syntax is mediated through the prosodic structure of a given utterance/sentence. This means that structural preferences are sometimes overridden by phonological conditions (see Hendriks 2003 for a relevant discussion). For instance, it is possible that there are some cases in which one version of the pair was produced with a prosodic pattern that would be more compatible with the alternative reading, and for which listeners opted to choose prosodic cues rather than context in assigning the ultimate meaning of the sentence (see, e.g., (T6a) and (T8a)) (Schafer et al. 2000a, b for relevant discussion).[140]

Contrary to the stereotypical images of the supposedly legitimate intonation often seen in the literature, our findings in the comprehension test clearly suggest that this is not the case. The test result also provides evidence for the claim that subject-oriented FNQs reflect processing difficulty but not ungrammaticality (discussed in Chapter 2) and, at the same time, challenge the "across-the-board" adnominal and adverbial approaches, neither of which would predict such intricate interactions among various factors in the process of FNQ interpretation. The present analysis predicts that the parser makes use of elaborated prosodic information to build up the phrase structure, and this is in fact reflected in the experiment reported above.

This may lead to the assumption that prosody is faithful to the phonological structure mapped from the syntactic structure (see Selkirk 1986; Selkirk and Tateishi 1991; Truckenbrodt 1995). However, it is necessary to keep in mind that the fact that the location of the prominent pitch accent has pragmatic effects may not itself warrant the claim that pitch accent encodes a pragmatic concept. The present analysis provides distinct structures for the two

---

of a given string of speech.

[140] This demonstrated a very convincing role for prosody, in opposition to the findings of Fox, Tree, and Meijer (2000).

types of FNQ sentences (see section 4.1 (Chapter 4)). This is an advantage in that we are able to account for data exhibiting both distributive and non-distributive readings, unlike existing theories that assume only that FNQs are computed within either VP or NP.

Selkirk and Tateishi (1991) claim that a rise in pitch corresponds to a syntactic boundary in Japanese (see also Shiobara 2004). In the case of the b-sentences of (5.15), the pitch rise observed on the FNQ (in Figures 5.2 and 5.4 and Appendix A) specifies its syntactic position at the left edge of a VP. However, it is not entirely clear how a theory making reference to edges of syntactic maximal projections accounts for the aforementioned intonational (and interpretive) difference between a-sentences and b-sentences. Instead, an account in a flexible syntax such as CCG maintains that syntax determines the location of prosodic boundaries but the boundary type varies (i.e., AP boundary or IP boundary) in reference to informational grouping.[141]

5.5 Summary

We conclude the discussion by summarizing the main points of this chapter. First, it was argued in sections 5.1 and 5.2 that information structure is necessary for the interpretation of sentences involving FNQs and that the theory of information structure should provide an explanatory account of the facts with respect to FNQ interpretation and the variation seen in interpretation that is directly related to differences in syntax, semantics, and pragmatics. Note that pragmatics includes intonation since the difference in intonational phrasing, whether NP-related or VP-related, crucially lies in the information structure.

[141] The variability in location of insertion of a pause (i.e., an IP-boundary leads the pitch to resetting) might be speaker dependent, because a variety of linguistic factors, including focus, information status, discourse structure, etc. would determine the pitch range of each separate intonation phrase (see Venditti 2006, and Venditti et al. 2008; Féry and Ishihara 2009 for a detailed discussion).

Second, it was found in section 5.3 that, in terms of prosody, local NP-related FNQs and non-local NP-related ones are almost identical if an FNQ can consist of a single intonational phrase (or prosodic constituent) with the host noun, despite the difference in the surface structure (or morphosyntactic constituent). This was confirmed in section 5.4 by the comprehension test we conducted. As a result, we should redefine a single (downtrend) intonational phrase of the FNQ and its associated NP as a prosodic dimension having optionally a pause or other lexical items (e.g., *kinoo* 'yesterday'), as long as the FNQ does not exhibit a sharp F0 rise on the pitch contour.

Although the exact implementation remains to be determined, we can see that there is a correlation between prosodic phrasing and interpretation such that each phonetic realization (i.e., distinctive intonational pattern) is a consequence of information partitioning that serves to determine the unique interpretation. The next aim of this study is to set up a flexible grammatical theory to cover the two types of FNQ constructions in Japanese, which permits us to capture both their information structure and prosody in a simple and straightforward manner.

CHAPTER 6

A Formal Account in CCG

This chapter proposes a formal analysis of FNQ constructions within Combinatory Categorial Grammar (CCG). CCG, unlike other existing theories, provides a formal account of syntactic, semantic, and prosodic factors, and is thus optimal for dealing with the problems raised in earlier chapters with regard to the analysis of these constructions. Considerable attention is given to the characterization of NP-related FNQ construal, and based on the parallelism between anaphoric pronouns and NP-related FNQs, two types of lexical rules are proposed for Japanese FNQs. The derivations within CCG present a step-wise combination by making the most of a small number of combinatory syntactic rules and by putting modal control in the lexicon without stipulation. The proposed CCG analysis offers the flexibility required to capture straightforwardly and succinctly the reality that the two readings of FNQs in Japanese are differently generated with regard to information structure and the related intonation.

6.1 Combinatory Categorial Grammar

In the CCG framework, words are assumed to project expressions in some logical language, and it is these that combine to result in a logical form corresponding to the interpretation of the sentence (Steedman 1996: 55-6, 2000b: Chapters 4 and 5). CCG is surface-compositional (like LFG and HPSG) in the sense that each step of a syntactic derivation is identified with an invariant semantic operation that relates the logical form of a grammatical category to those of its component parts (Steedman 2012: 17). CCG generalizes surface constituency to give substrings such as *Marcel proved* and even *a policeman a flower* the full status of constituents (see Steedman 1996, 2000a, b,

2012; Steedman and Baldridge 2011).

Within CCG, a small number of combinatory syntactic rules dictate how categories can be combined (e.g., function application (FA), functional composition (FC) indicated by **B** in the tree diagram, and type-raising (TR), indicated by **T** in the derivations below), along with the lexical specification. These operations crucially ensure the correct semantic interpretation, assuming that the semantic composition is done in parallel with the syntactic build-up of a phrase. In fact, the syntactic rule is simply the translation of a semantic rule of FA (Steedman 2000b: 37). TR, especially of subjects, has been considered a common rule in the semantic tradition (see, e.g., Montague 1973; Partee and Rooth 1983; Partee 1986, 1992): all arguments, such as NPs, can freely type-raise to become functions over function categories.

More specifically, TR changes the function/argument relationship between two constituents such that a constituent that begins as the argument of some function turns into (via TR) the functor that takes that function as its argument to produce the same result as the one obtained by applying the original argument, without complicating the syntactic derivation. This is possible by assuming that each syntactic category is associated with a set of semantic types rather than with a single uniform type, so each lexical item is entered in the lexicon in its simplest type, and there should be principles for assigning additional (predictable) interpretations of more complex types to those expressions that can have them (Partee 1995: 343).

CCG allows us to obtain a flexible notion of syntactic structure, one that is directly compatible with the boundaries in accordance with the phonology. Importantly, CCG offers the possibility that prosody and syntax are one system, integrating prosodic information with the standard grammatical categories to more directly capture intonation structure, together with its interpretation as information structure.[141] In this theory, the focus-marking property of pitch

[141] For a different view of grammar that takes the semantic and phonological components as generative in addition to the syntactic component, see, e.g., Jackendoff (1997, 2007).

accents belongs at the level of the word, whereas the theme/rheme-marking property belongs at the level of phrasal constituents (Steedman 2000b: 118), which will be described in section 6.2.

In CCG, surface structure is strictly a record of the process of deriving such logical forms via combinatory operations that are type-driven, rather than structure-dependent. Surface structure is therefore not a grammatical level of representation. To that extent, the theory is not only monotonic in the sense of never revising the structures it builds, but also monostratal in the sense that it builds only a single level of structure, namely, the logical form (Steedman 2000b: 87). We can simply subsume both intonation structure and surface structure under a single notion of information structure (Steedman 2000b: 124).[142] In the architecture of CCG (Figure 2.1 (Chapter 2)), information structure boundaries and surface syntactic boundaries coincide, which means that there are a number of prosodic effects that depend on the surface structure permitted by CCG in a direct manner. This seems to have the merit of being in support of the current approach to Japanese FNQ constructions.

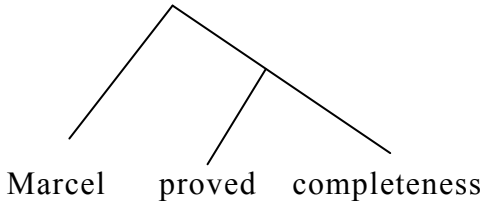
6.2 Intonation marking

Before going into a concrete analysis of the FNQ construction, let us consider how intonation is represented in the CCG framework. As previously mentioned, Steedman (1996, 2000a, b) argues that intonational phrase boundaries and surface syntactic boundaries coincide, rendering the "unconventional" syntactic structure in (6.1):

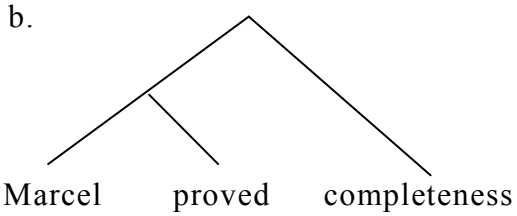
[142] Under this interpretation of surface structure, it is unnecessary to postulate an additional independent prosodic structure, as do Selkirk (1984, 1986, 1995), and Nespor and Vogel (1986).

(6.1)

a.



b.



According to Steedman (1996, 2000a, b), in English the rhythm rule applies in certain dialects to move the stress on the first syllable of 'Marcel', and to the intonational phrase 'Marcel proved', requiring, within his framework, that the latter be analyzed as a syntactic constituent as in ((6.1) b). ((6.1) a) is consistent with a f(ocus)-structure assignment in which the subject is the topic and the verb phrase is focused.[143] Since the VP is an f-structure constituent, it must be pronounced as an intonational phrase. ((6.1) b), with the intonational phrasing indicated (i.e., *Marcel proved* forms a single intonation phrase) can be an answer to: I know which result Marcel PREDICTED. But which result did Marcel PROVE? Since ((6.1) a), and ((6.1) b) are valid surface strings in CCG, it is obvious that CCG provides a framework for bringing intonation structure and its interpretation – information structure – into the same syntactic systems (see Figure 6.1 below). Note that in this framework, the flexible constituency should not be regarded as merely spurious ambiguity, as the range of possible groupings within a string will correspond to a range of different intonation contours, each reflecting a different information structure.

Steedman (1996, 2000a, b) considers the following minimal pair of dialogues, in which intonational tunes are indicated both informally via parentheses and UPPER CASE LETTERS (indicating main stress), and in the standard notation of Beckman and Pierrehumbert (1986) for the intonation contour, in which prosodic phrases are specified solely in terms of two kinds of elements that we think are enough in the present discussion, i.e., the pitch

[143] See Rooth (1992) and Schwarzschild (1999) for influential theories on the meaning of focus.

accent(s) and the boundary:

(6.2)

Q: I know who proved soundness. But who proved COMPLETENESS?

A: (MARCEL) (proved COMPLETENESS).

H*L L+H* LH%

Rheme *Theme*

(6.3)

Q: I know which result Marcel PREDICTED. But which result did Marcel PROVE?

A: (Marcel PROVED) (COMPLETENESS).

L+H*LH% H* LL%

Theme *Rheme*

Steedman (1996, 2000a, b) explains (6.2) and (6.3) as follows: In ((6.2) A), there is a prosodic phrase on MARCEL including the sharply rising pitch accent that Pierrehumbert and Beckman call H*, immediately followed by an L boundary, perceived as a rapid fall to a low pitch. There is another prosodic phrase having the somewhat later-rising and (more importantly) lower-rising pitch accent called L+H* on *COMPLETENESS*, perceived by a null tone (and therefore an interpolated low pitch) on the word *proved* and immediately followed by an utterance-final rising boundary, which is indicated as LH%.[144] In ((6.3) A) above, the order of the two tunes is reversed: this time, the tune with the pitch accent L+H* and boundary LH% occurs on the word *PROVED* in one prosodic phrase, *Marcel PROVED*, and the other tune with the pitch accent H* and boundary LL% is carried by a second prosodic phrase

[144] The only difference between L+H* and H* accents is an extended range, the steepness of the rise, and perhaps a delayed peak in the L+H*, so in running speech these features might be restricted, resulting in an H* accent phonetically (see Hedberg 2008 for a related discussion).

COMPLETENESS.

From these observations, it seems obvious that the intuition that these tunes strongly convey systematic distinctions in discourse meaning is inescapable. For example, exchanging the answer tunes between the two contexts in (6.2) and (6.3) yields complete incoherence. Prevost (1995) claims that the tunes L+H* LH% and H*L (or H*LL%) are respectively associated with the "theme" and "rheme" of the sentence; these terms are used in the sense of Mathesius (1929) and Halliday (1967) and correspond roughly to a generalization of the more familiar terms "topic" and "comment", which however are generally restricted by definition to traditional constituents.[145] Somewhat informally speaking, the theme can be thought of as corresponding to the content of a contextually available *wh*-question, which may be explicit, as shown in (6.4) and (6.5) below, or implicit in other discourse content. The position on the pitch accent in the theme, if any, distinguishes words corresponding to focalized elements of the content that distinguish this theme from other contextually available alternatives. The rheme can then be thought of as providing the answer to the implicit *wh*-question, with the pitch accent again marking focused words that distinguish this answer semantically from other potential answers.

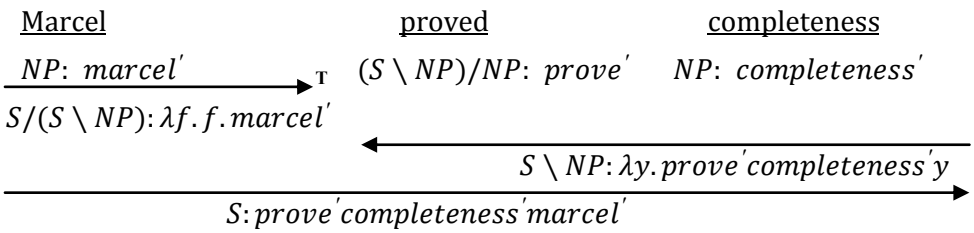
The system comprising the oppositions of theme/rheme and focus/background is known as information structure.[146] The fact that CCG allows alternative derivations such as (6.4) and (6.5) offers an obvious way to bring intonation structure and its interpretation – information structure – into the same syntactic system, as everything else (Steedman and Baldridge 2011:

[145] In Steedman's theory (2000a, b), anything marked with the L+H* pitch accent should be a theme, whereas for Gundel and Fretheim (2004), L+H* can mark contrastive foci. The latter also say that L+H* is used for functions other than marking a topic, such as marking contrast.

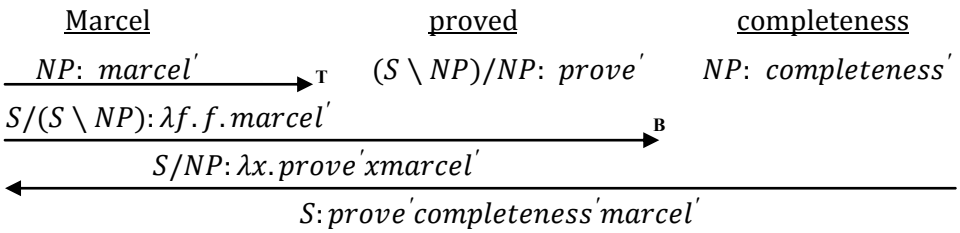
[146] This partitioning enables us to distinguish the "marked" theme from the "unmarked" theme (see Steedman 2000b: 105 for description). Steedman (2000a, 2012) provides a more formal definition in terms of the "alternative semantics" of Rooth (1985, 1992), and the related "structured meanings" of Cresswell (1973, 1985), von Stechow (1991), and others.

210). Crucially, the alternative derivations (as in (6.5)) are guaranteed to yield the same predicate argument relations, as exemplified by the logical form that results from the two derivations. Note that the derivations build this logical form via different routes that construct lambda (λ) terms corresponding semantically to the theme and rheme.[147] The nonstandard derivation (6.5) is allowed for the sentence, as is the traditional derivation (6.4):

(6.4)



(6.5)



The derivation (6.4) corresponds to the information structure associated with the intonation contour in (6.2), whereas the derivation (6.5) corresponds to that in (6.3).

It is not surprising that when intonational boundaries are present, they will coincide with syntactic boundaries in CCG. The primary reason for this is that the partition of the sentence in (6.5) into the object and a non-standard (but fully interpreted) constituent S/NP corresponding to the string *Marcel proved*

[147] The lambda symbolizes a set-forming operation. For example, where *x* is a variable over individuals, the expression in (i) represents the (characteristic function of the) set of individuals who talk:
(i) λ*x*[talk(*x*)]
This has the same denotation as the predicate *talk* by itself.

makes this theory structurally and semantically suited to the demands of intonational phrasing.[148] In other words, we can make CCG sensitive to the presence of intonational phrase boundaries, as reflected in the two derivations (6.4) and (6.5) for the string *Marcel proved completeness*. They are the intonation contours that convey a meaning roughly paraphrasable as "What Marcel proved is completeness" and "It's Marcel who proved completeness", respectively.

Another point worth noting is that both examples include regions of the sentence that have no tone marking in Pierrehumbert's system, and that those examples are realized with low pitch and no stress or accent. Again, the discourse semantics seems intuitively clear. Pitch accents mark the parts of the theme and rheme that are interesting, usually because of a contrast with alternative concepts, in the discourse model. By contrast, the parts with no pitch accent are non-contrastive background information, as exemplified by *proved* in (6.2) and *Marcel* in (6.3).[149]

The architecture of the theory to be adopted in our analysis is represented in Figure 6.1 (next page), which is more refined than Figure 2.1 (Chapter 2). The modules of phonological form, surface structure, and intonational structure are unified into a single surface derivational module. The lexicon is projected onto the language, which consists of phonological strings Φ paired with a syntactic start symbol Σ of the grammar, such as S, paired with a logical form Λ.

[148] The interpretation in question can be written λx[want'x you'] using the standard notation of the λ-calculus (see Partee, ter Meuren and Wall 1990 for a comprehensive description).

[149] The contrast between focus and background is largely comparable to Halliday's (1967) "new" and "given" information (see Chapter 5 for a detailed discussion).

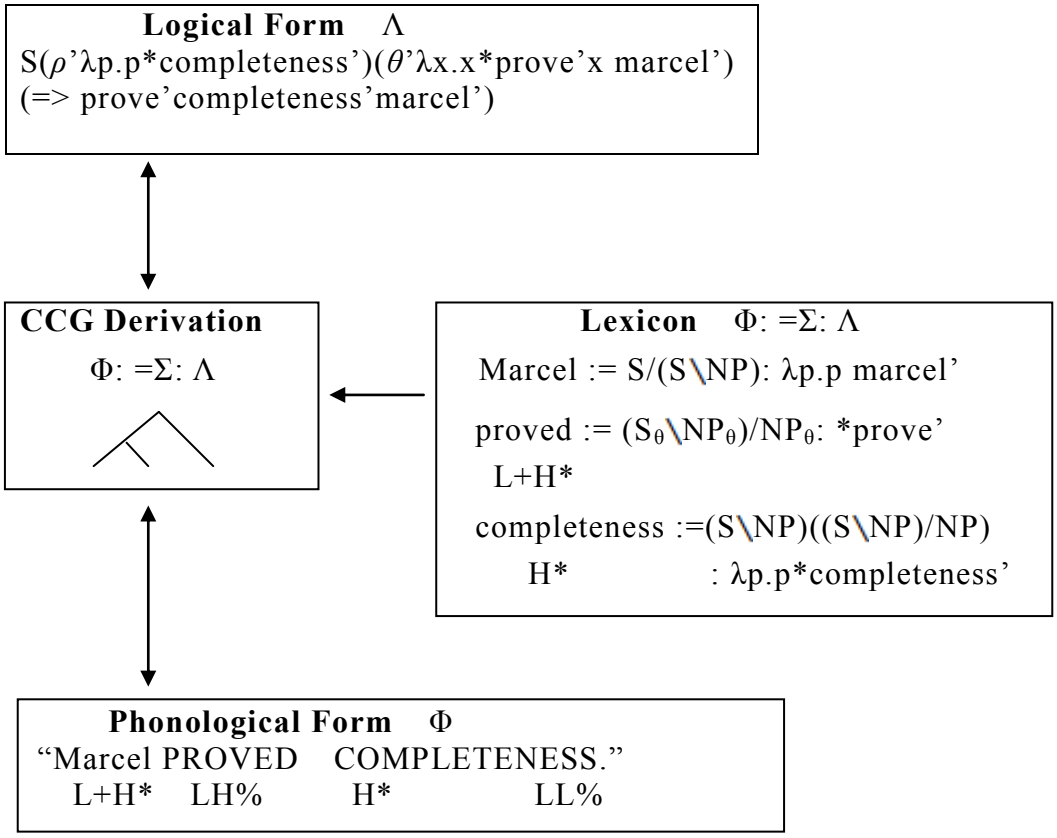


Figure 6.1. **Architecture of CCG (Steedman 2007: 605)**

As previously discussed, there has been a potential problem in most previous studies of FNQ constructions in that examples without contexts were used. Without contexts, speakers may understand the information status of the subject and the verb differently, which may influence the prosodic pattern. To avoid this problem and to arrive at an explicit account of contextual effects in connection with FNQ constructions, the current study concentrates on information units in sentences within the larger context of a question and answer discourse. This is because such a format presumably makes it easier to grasp the distinction between a theme and a rheme. In the previous chapter, we considered illustrative examples ((5.13) a-c) that were constructed along with contexts. (We will shortly look at these derivations in section 6.4) Specifically, we constructed a question sentence for each test sentence containing an FNQ, such that the test sentence was an appropriate answer to the question (see

section 5.3 (Chapter 5)). In this way, the information status can be controlled considerably with variant F0 contours of FNQs. There was every reason to expect the intonation to be congruent with the syntax. It should be noted that there is no claim here that intonation is related to the syntactic derivation. The claim is simply that when intonational boundaries *are* present, they will coincide with syntactic boundaries (Steedman 2000a, b). This assumption provides a better solution to the interpretive problems with FNQ sentences (as will be shown in section 6.4).

6.3 Quantifier scope

We take a look at the treatment of the quantifier scope in CCG, which will be helpful in dealing with FNQ scope in the next section. It is standard in CCG to assume that the ambiguity of sentences such as (6.6) is to be accounted for by assigning two logical forms which differ in the scope assigned to these quantifiers, as in ((6.7) a) and ((6.7) b):

(6.6)
Every boy admires some saxophonist.

(6.7)
a. $\forall x.boy'x \rightarrow \exists y.saxophonist'y \wedge admires'yx$
b. $\exists y.saxophonist'y \wedge \forall x.boy'x \rightarrow admires'yx$

The question arises of how the grammar can assign all and only the correct interpretations to sentences with multiple quantifiers. CCG, in trying to do away with movement or the equivalent in syntax, has eliminated non-monotonic operations from the syntax, so to have to restore them at the level of the logical form would be an embarrassment given the strong assumptions of transparency between syntax and semantics from which this and

other monotonic theories begin (Steedman 2000b: 60). Given the assumptions of syntactic/semantic transparency and monotonicity that are normal in the Frege-Montague tradition, it is tempting to try to use nothing but the derivational combinatorics of surface grammar to deliver all the readings for ambiguous sentences like (6.6). Two ways to restore monotonicity have been proposed in CCG, namely enriching the notion of derivation via type-changing operations and enriching the lexicon and the semantic ontology (Steedman 2000b: 61).

It is standard in the Frege-Montague tradition to begin by translating expressions such as *every boy* and *some saxophonist* into "generalized quantifiers", in effect exchanging the roles of arguments such as NPs and functors such as verbs by type-raising the former (see, e.g., Lewis 1970; Montague 1973; Barwise and Cooper 1981).

In the light of the assumptions of CCG discussed above, one way to incorporate generalized quantifiers into the semantics of determiners is to transfer type-raising to the lexicon, assigning the following categories to determiners such as *every* and *some*, making them function from nouns to type-raised NPs, where the latter are simply the syntactic types corresponding to a generalized quantifier:

(6.8)

every := $(T/(T\backslash NP))/N: \lambda p \lambda q. \forall x.px \rightarrow qx$

every := $(T\backslash(T/NP))/N \lambda p \lambda q. \forall x.px \rightarrow qx$

(6.9)

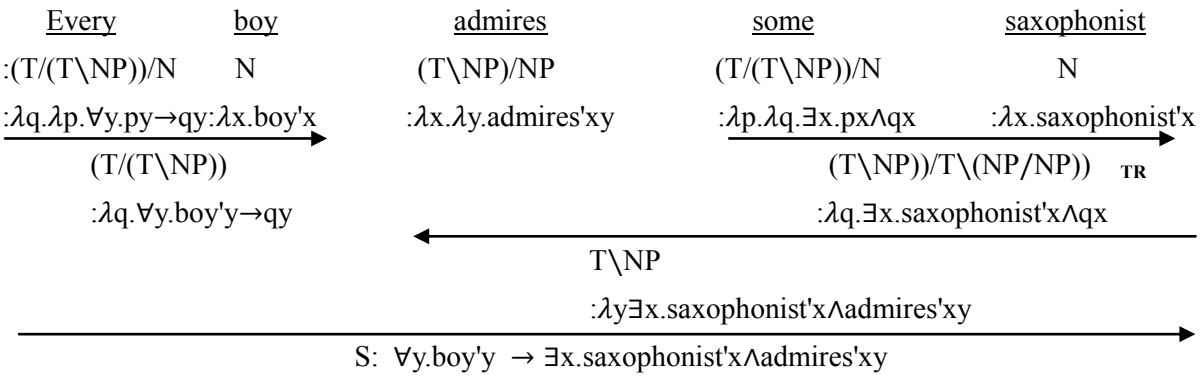
some := $(T/(T\backslash NP))/N: \lambda p \lambda q. \exists x.px \wedge qx$

some := $(T\backslash(T/NP))/N \lambda p \lambda q. \exists x.px \wedge qx$

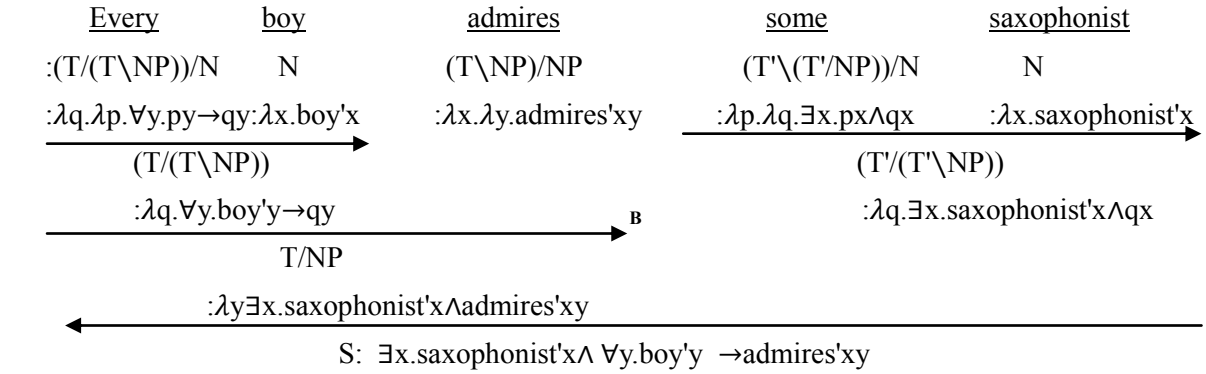
Given the categories in (6.8) and (6.9), the derivations that CCG permits will provide the two distinct logical forms shown in (6.7) without involving

structure-changing operations, as shown in (6.10) and (6.11).

(6.10)



(6.11)



The examples containing quantificational NPs involve scope ambiguities, with different interpretations depending on which expression takes the other in its scope. In CCG, the idea that such a semantic quantifier scope is limited by syntactic derivational scope in this way has some very attractive features: the available scoped readings can be computed directly from the combinatorics of syntactic derivation embodied in CCG.[150] Given the above architecture, we will demonstrate that intonation and phrasing are derived from syntactic

[150] As Steedman (2000b, 2012) assumes, linking derivation and scope as simply and directly as this, however, makes the obviously false prediction that in sentences where there is no ambiguity of CCG derivation, there should be no scope ambiguity. See Steedman (2000b, 2012) for a concrete proposal employing the Skolem term to handle such cases, though we will not explore this possibility in the present study.

structures by showing that the quantifier scope can be read off the surface structure. The CCG analysis to be proposed concerning the FNQ construction can be viewed as part of the phonological linearization process, which will offer a new perspective on the investigation of whether different focus/non-focus positions can be linked to prosodic properties of the language. In the next section, we will see how our illustrative examples (used in section 5.3) are accounted for.

6.4 Sample derivations

With the background discussed in the previous sections, we now propose an analysis of the two types of FNQs within the framework of CCG. For illustration, we will take up crucial examples that we considered in section 5.3 (Chapter 5) and offer syntactic and semantic derivations, which would apply to examples such as (5.15) and others.

We will show how it is possible within the CCG system to differentiate between the two types of FNQs (i.e., NP-related FNQs vs. VP-related FNQs). For this purpose, we are defining the structure of FNQ sentences by a set of rules that express the structural properties of strings and their interpretation. Along the lines of Steedman (1996, 2000a, b; 2012), we assume that natural languages are formal systems of inference preserved as the central methodological assumption, and the process of interpretation is, accordingly, an incremental process of projecting model-theoretic content.

We posit that **Type I** (for NP-related FNQs) is lexically different from **Type II** (for VP-related FNQs), as defined in (6.12) and (6.13) below, where the forward and backward slashes indicate whether a given category is a modifier or an element taking an argument. These categories are a set of lexical rules that express the structural properties of strings and their interpretation, and they are type-raised so that they may have some syntactic and semantic types as generalized quantifiers (as discussed in section 6.3). The present study

follows Baldridge (2002), and Steedman and Baldridge (2011) in assuming that rules and function categories are "modalized", indicated by a subscript on slashes. The modality "$_{\times}$" in **Type I** (6.12a) allows limited permutation, which permits rules such as crossing functional composition rules as in (6.12b) (taken from Steedman and Baldridge 2011: 190). The modality "$_{*}$" in **Type II** (6.13a) is the most restricted and allows only the most basic application rules, which allows the rules of functional application as in (6.13b) (taken from Steedman and Baldridge 2011: 187). For more discussion of the modalities employed in CCG, see Steedman and Baldridge (2011: Section 5.3).

(6.12)

a. **Type I**: $(NP\backslash S)\backslash_{\times}(NP\backslash S)$

b. $X/_{\times}Y: f \quad Y\backslash_{\times}Z: g \quad \Rightarrow \quad X\backslash_{\times}Z: z.f(gz) \qquad (>\mathbf{B}_{\times})$

c. *roku-nin* 'six-Cl' $\Leftrightarrow$ $(NP\backslash S)\backslash_{\times}(NP\backslash S)$: $\lambda x\lambda y.([|y|=6](ana' y))\ yx$

(6.13)

a. **Type II**: $(NP\backslash S)/_{*}(NP\backslash S)$

b. $X/_{*}Y: f \quad Y: a \quad \Rightarrow \quad X: fa \qquad (>)$

c. *roku-nin* 'six-Cl' $\Leftrightarrow$ $(NP\backslash S)/_{*}(NP\backslash S)$: $\lambda f.([|f|=6])$

We have already seen in Chapter 4 that an NP-related FNQ behaves like an anaphoric pronoun. Given that the anaphorically (deaccented) phrase contributes to the domain of the quantification of an FNQ, the term "*ana*' y" in ((6.12) c) is represented as an anaphor bound to the (interpretation x of the) subject of the control verb. (For details, see Steedman 2000b: Chapter 4.) Recall that the parallelism between the anaphora and scope of FNQs lies in the fact that, in both, an antecedent has to be found, and so the category proposed in (6.12) may extend naturally to expressing E-type anaphora effects.

With this in mind, let us examine how the desired effects are derived. We will show, using the data in ((5.13) a)-((5.13) c), repeated below in

(6.14)-(6.16) but with relevant information partition, how the present analysis works well in accounting for these examples.

The denotation of FNQ is potentially either in focus or background (in the sense of CCG), each of which bears a distinct prosodic realization (see Chapter 5 for discussion). The point to observe is whether intonation helps to determine which of the possible bracketing structures permitted by the combinatory syntax of Japanese is intended.

(6.14) (Example of NP-related FNQ)[151] =((5.13) a)

Context: I've heard that six people got involved in an accident. But what kind of accident?

Target: **Seijika ga** *roku-nin* // TERO ni makikomareta-n-desu.
politician Nom six-Cl terrorism in got involved-Nlz-Cop
[$_{Th}$ Focus Background] [$_{Rh}$ Focus Background]
'Six (and only six) politicians got involved in (the) terrorism.'

Assuming that topics are given (or presupposed) and foci are new in the discourse, the question-answer-pair utterance follows since the answer to the *wh*-question is necessarily new, and the rest of the sentence is either presupposed (present in the question) or non-presupposed (absent in the question) (see Schwarzschild 1999, 2002). Hence, the denotation of an FNQ is potentially in either focus or background, each of which bears a distinct prosodic realization, as discussed earlier in (1.3) (Chapter 1). In the current proposal, an NP-related FNQ prosodically belongs to a theme-background or a rheme-background, both of which influence intonational realizations (as we have seen in Chapter 5). For instance, if it is a theme-background, then it is

[151] The examples in (6.14)-(6.16) also illustrate the partial range of possibilities for the distribution of focus and background units with theme and rheme, employing the theme focus (subordinate focus by Erteschik-Shir 1997) and the rheme focus, and each of which is regarded as the most informative word/phrase in the unit (see Steedman 2000b: Chapter 5 for a comprehensive discussion).

presupposed to be already available and uniquely identifiable in the discourse context (as in (6.14)).

To see how the syntax and semantics is derived, we provide a derivation in a (simplified) version of CCG (Steedman 1996, 2000a, b, 2012; Steedman and Baldridge 2011). FNQs (e.g., *san-nin*) are assigned nominal categories such as adjectives NP\NP, while they can also be realized as adverbials such as VP/VP (see (6.12a) and (6.13a) above), though both categories are type-raised in (6.12) and (6.13). Most importantly, the FNQ takes categories of the sought X\X (or X/X), which, using standard application rules in CCG, takes an X to its left (or right) to produce exactly the same category, which is what adjunction does as well. Categories of the form X/X and X\X are how CCG handles modifiers such as adjectives and adverbs.[152] The syntactic and semantic derivation of (6.14) is given in Figure 6.1, where the meaning of an FNQ sentence is sensitive to the order of composition, which affects the interpretation. (In the figure, information-structural markers are employed in the figures below; θ is for a theme marker and ρ is for a rheme marker.)

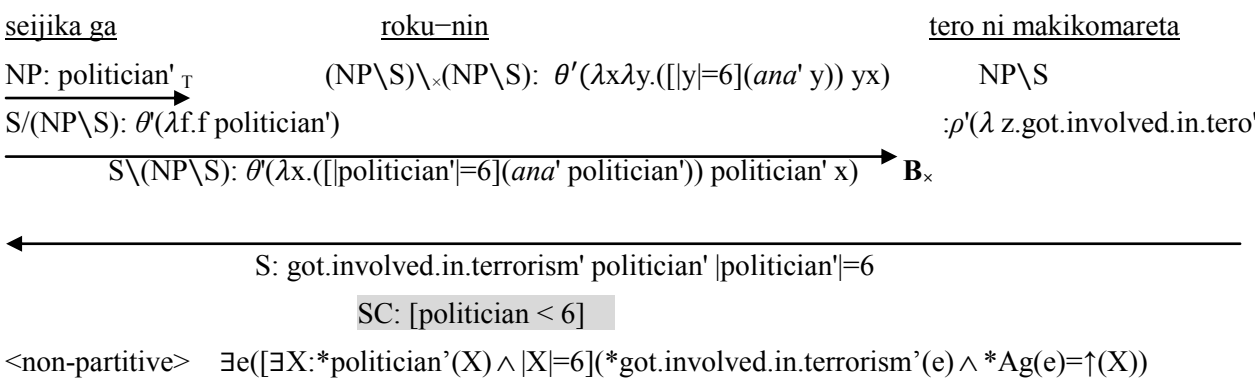


Figure 6.1. Sample derivation of (6.14)

[152] This approach correlates with the standard Montagovian semantics. For example, VP-adverbs are functors, taking (intensions of) VP-denotations as arguments, and returning VP-denotations as values. Categorial grammar formalisms define the proof-theoretic analogue of this semantic device, with the construction of a premise at the extraction site, which is abstracted over at some arbitrary point in the proof sequence by conditions to yield a predicate type appropriate for combining with the generalized-quantifier type (see Morrill 1994 for more discussion).

In the above derivation, as the first step, the subject noun must be type-raised for composition to form the subject-plus-FNQ; that is, type-raising is needed for syntactic, but not semantic, reasons. The subject and the FNQ are combined by a crossing composition rule in (6.12b) with the second step, and the final step in the derivation is taken by backward application. Note that, as discussed in section 3.1.4 (Chapter 3), we render the scope relations between quantifying expressions as scope statements (indicated as SC and shaded in the figures) of the form $x<y$ expressing that the term involving variable y has scope over the term involving x. The statement of scope relations is defined at some level representing a predicate-argument structure such as logical form. In this view, scope relations between terms are captured directly as relations between terms in the syntactic derivation, not as a relation between nodes in the tree structure (see also Kempson et al. 2001 for a similar view).[153] It will become apparent that the scoping possibilities of FNQs can be derived from the pure combinatorics of CCG derivation without a separate storage device (Steedman 2012: 17). Leaving aside technical details, the scope statements proposed here are essentially the same as the Skolem terms employed in Steedman (1996, 2000b, 2012) and allow us to capture the same observations.[154]

We will follow de Swart (1996) in that indefinite NPs are interpreted as existential quantifiers, which are construed as taking an arbitrarily wide scope with respect to the environment within which they are contained (for discussion, see Steedman 1996, 2000b, 2012; Kempson et al. 2001). Note that wide scope effects associated with NP-related FNQs (giving rise to non-partitive interpretations) are construed as referring expressions (e.g., anaphors), uniquely picking out some element that the speaker has in mind (Fodor and Sag 1982: 358). We assume that NP-related FNQs take a wide scope over the

[153] The assumption that (relative) scope statements are collected in the CCG derivation is also similar to that defined in Minimal Recursion Semantics (Copestake et al. 1998).
[154] Skolem terms are lexically unspecified as to dependency. Whether they become functional terms or constants depends on a dynamic process of *skolem* term specification that can occur freely during derivation (Steedman 2012: 22).

subject NP, resulting in non-partitive interpretation, whereas VP-related FNQs take a narrow scope over the subject NP, resulting in partitive interpretation (see section 4.2.8 (Chapter 4)).[155] As indicated in Figure 6.1, and Figures 6.2 and 6.3 below, the scope property plays an important role in the interpretation of FNQ sentences. Indeed, there is a close relation between the canonical interpretation structures that they convey according to the theory sketched in Chapter 4 and traditional notions of constituent structure, as far as FNQ constructions in Japanese are concerned.[156] Given this syntax, in the computation of meaning the composition of the NP and the FNQ must occur prior to composition with other elements of the sentence (i.e., the VP), as illustrated in Figure 6.1. This seems to have something to do with native speakers' strong preference for resolving any grammatical dependency as soon as possible, rather than arbitrarily – at any level at any time (see, e.g., Kempson et al. 2001, 2004, 2006, and Kiaer 2005).

Next, let us consider the example of VP-related FNQs in (6.15), which is intended to elicit an answer providing the quantity of the given entity, specifically, of "how many of men". In contrast to (6.14), when the quantifier *roku-nin* is highlighted by the focus, sentence (6.15) exhibits an intonational phrase break immediately before the quantifier, accompanied by a pitch reset. Note that (6.15) can be read with an intonational pattern different from that of (6.14), as the F0 pitch contours indicate (see Figure 5.3 (Chapter 5)). In the case of VP-related FNQs, a quantifier typically obtains prominence because it

[155] In Figures 6.1-6.3, to facilitate explication, in the bottom line, a tripartite quantificational structure (as described in section 4.2.3) is adopted with event semantics (as we saw in section 4.2.8). For reference, the semantics in classic predicate logic are provided (see section 4.1.4). The formula in (i) represents a partitive reading, and the one in (ii) a non-partitive reading:

(i) $\exists$ X[politician'(X)$\wedge$|X|=6$\wedge$got.involved.in.terrorism'(X)]

(ii) $\exists$ X[politician'(X)$\wedge$ |X|=6$\wedge \forall$ y[politician'(y)got.involved.in.terrorism'(X) $\rightarrow$ y=X]]

[156] Hajičová et al. (1998) examine the relation between information structure and quantifier scope, showing that while information structure often plays an important role in the determination of scope, the relation is not reducible to a simple mapping. We assume that it is important to represent information structure explicitly, and to clearly motivate and define information-structure roles, so that these connections can be thoroughly explored.

is considered the most informative element in the informational unit (Lambrecht 1994; Gundel 1999; Gundel and Fretheim 2004).

(6.15) (Example of VP-related FNQ) (=((5.13) b))

Context: I've heard that people got involved in terrorism. But how many?

Target: **Seijika ga** // *ROKU-nin* tero ni makikomareta-n-desu.
politician Nom six-Cl terrorism in got involved-Nlz-Cop
[$_{Th}$ Background] [$_{Rh}$ Focus Background ...]
'Six (and only six) politicians got involved in (the) terrorism.'

A sample derivation making use of (6.13a) is represented below. The VP-related FNQ is a function over the following verb to form a verb phrase, thus deriving NP\S by forward application (see (6.13a)). This category is then combined with the subject by forward application. Note that, in this derivation, the scope statement (shaded) indicates that the host noun has scope over the quantifier, resulting in a partitive reading in the present account.

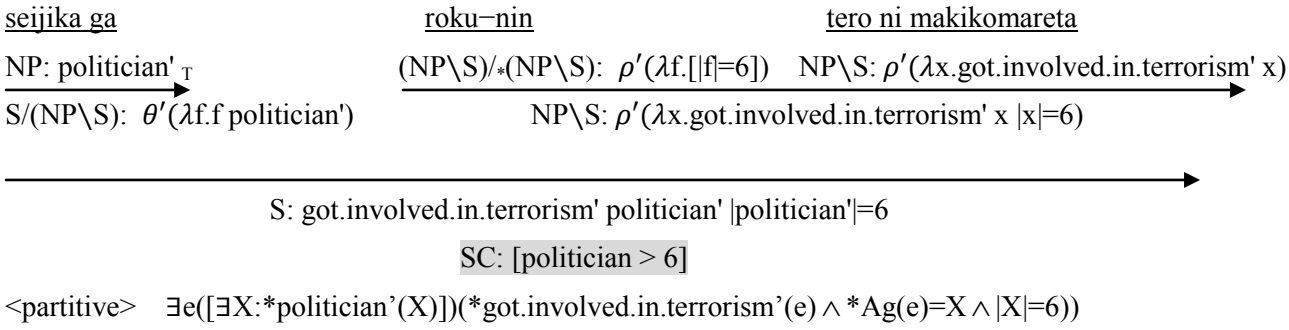


Figure 6.2. Sample derivation of (6.15)

Finally, let us look at another pattern of NP-related FNQs, illustrated in (6.16). In this case, the subject (i.e., *seijika*) is particularly emphasized. Unlike in (6.14), a break intervenes between the quantifier and its associated NP. At first sight, the FNQ appears not to be phrased together with the host NP due to

the presence of the obvious boundary, but in fact, the quantifier *roku-nin*, bearing a non-local relation to the associate NP, exhibits a downstep rather than a pitch reset as (6.16) indicates (see section 5.3 (Chapter 5) for discussion).

(6.16) (Example of NP-related FNQ) (=((5.13) c))

Context: I've heard that six people got involved in terrorism. But who was it that got involved in it?

Target: **SEIJIKA ga** // *roku-nin* tero ni makikomareta-n-desu.
politician Nom six-Cl terrorism in got.involved-Nlz-Cop
[$_{Rh}$ Focus Background] [$_{Th}$ Focus …]
'Six (and only six) politicians got involved in (the) terrorism.'

As discussed in section 5.3 (Chapter 5), the FNQ *roku-nin* used in (6.16) is non-focused and uttered with a low pitch and no pitch accent, as shown in Figure 5.4 (Chapter 5). This FNQ is defocalized, which does not induce pitch reset, even though a pause is put immediately after the subject.[157] In the context of (6.16), only the subject *seijika ga* is focalized, and the associate FNQ *roku-nin* probably serves as background information (though it is part of the rheme), which is heard as least prominent in the rheme unit immediately after the focus phrase; hence, the pitch contour of the post-focal material is more or less lowered (or downstepped) (Kubozono 1993, 1995; Nagahara 1994; Sugahara 2003; Ishihara 2007, 2011).

The above observation would support the assumption that the quantifier's theme/background status rather than rheme/focus status can launch the quantifier to the right of the referent noun, which must be treated differently from VP-related quantifiers in (6.15). Example (6.16) also suggests that the prosody expected from the given syntactic boundaries can be overridden by the prosodic highlighting from focusing or the prosodic compression from

[157] Note again that the pitch contour of (6.16) (see Figure 5.4) cannot be predicted by previous studies, which assumed that FNQs always function as new/asserted information.

non-focusing at the level of information structure (as in (5.14)). A derivation of (6.16) is provided in Figure 6.3, which is the same as that of Figure 6.1.[158]

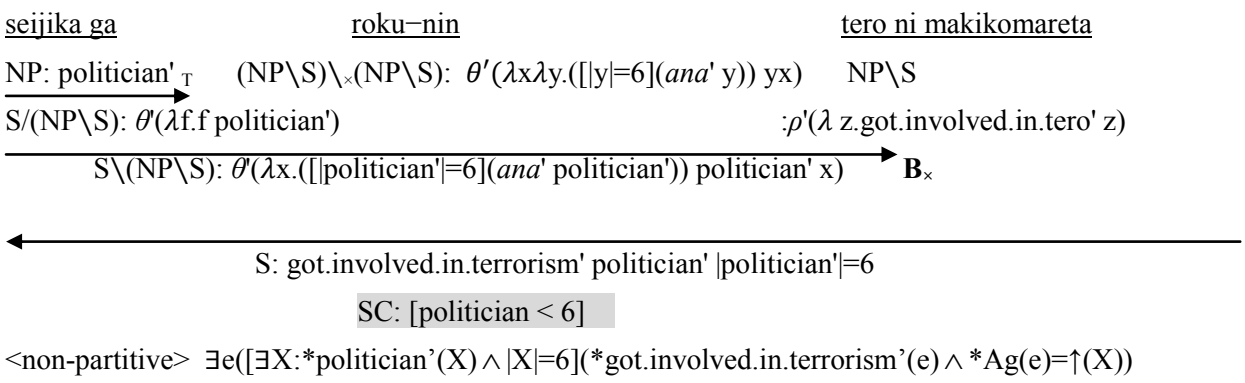


Figure 6.3. Sample derivation of (6.16)

We have seen that simple lexical operations such as application, composition, and type-raising engender a potentially very freely "reordering and rebracketing" calculus, producing a generalized notion of surface or derivational constituency (Steedman 2012: 82). It seems that the current analysis provides some firm empirical grounding: based on the difference in informational structuring, FNQs can receive the NP-related interpretation (or non-distributivity). As far as the intonational phrasing patterns exemplified in (6.14)-(6.16) are concerned, it can be said that the difference in intonational phrasing ultimately lies in the information structure.

This strongly indicates that an FNQ should be defined as an instance of expressing a discourse relation, not just an argument-head relation. In CCG, pitch accents are defined as functions over boundary tones into two major informational types, theme and rheme (Wood 1993: 80).[159] For instance, a

[158] Recall that Japanese FNQs can be ambiguous between the definite/referential and the existential quantificational interpretations (see section 4.2.7 (Chapter 4)). As an alternative to the λ-semantics in the derivation in Figure 6.3, the definiteness effect closely related to exhaustiveness observed in (6.16) could be explained by assuming that FNQs like the one in (6.16) introduce the iota operator "ι" (rather than the lambda operator "λ") to indicate (specific) definiteness (and maximality, too): there is a set of unique politicians, which substantially generates an equivalent intended interpretation to that in sentence (6.16).

[159] Prosodic phrases are specified solely in terms of two kinds of elements; the pitch

simple sentence like *Gakusei ga go-nin tsukue o mochiageta* 'Five students lifted a desk/desks.' (= (1.3)) can have either of two constituent bracketings, [[*Gakusei ga go-nin*] *tsukue o mochiageta*] and [*Gakusei ga* [*go-nin tsukue o mochiageta*]]; prosody determines which bracketing is chosen, as well as the information-structure role (e.g., rheme vs. theme, focus vs. background) of the constituents. For example, Figures 6.1 and 6.3 are shown to permit entirely left-branching sentence structures in CCG. Although information-structure roles are, in some sense, aligned to phrase structure constituents, the availability of non-standard constituents and possible constituent structures for an utterance gives the CCG approach a good deal of flexibility, which makes it crucially different from rigidly syntax-driven approaches to information structure such as the cartographic approach of Rizzi (1997).

6.5 Grammar and intonation

Finally, we focus on the relationship between grammar and intonation. We have addressed the prosody/syntax interface issues that are central to the CCG approach, and discussed a CCG-based proposal for the treatment of FNQ prosody, its interaction with syntax, and information structure. As Kitagawa and Fodor (2006) among many others have shown, grammaticality judgments are not purely syntactic. We have seen that the interpretation of Japanese FNQs is sensitive to the type (e.g., accentual phrase (AP) or intermediate phrase (IP)) and location of a prosodic boundary.[160] We have also suggested that ambiguous intonation contours are more common in speech than explicitly informative contours (see sections 5.3 and 5.4 (Chapter 5)), but we do not claim that intonation disambiguates syntactic derivation. Our claim is merely that when

accent(s) and the boundary (Pierrehumbert 1980, and Pierrehumbert and Beckman 1988).

[160] We argued in Chapter 5 that the difference between the intermediate phrase (IP) boundary and the accentual phrase (AP) boundary is the presence/absence of a pitch reset on the element immediately following the boundary in question. Hence, the AP boundary in Figures 6.1 and 6.3 do not show a pitch reset or coincide with the major syntactic boundary (e.g., the VP boundary).

intonation boundaries are present, they will coincide with syntactic boundaries (Steedman 1996, 2000a, b, 2012).

To successfully assign a structure and meaning to an FNQ sentence, it is necessary to have cues such as intonation or contextual information. In CCG, there is no separate level of intonation structure: the level of surface structure is also the level of both intonation structure and information structure. The flexible constituency which allows the description of FNQ sentences should not be called spurious ambiguity, if we consider the range of different intonation contours, each reflecting a different information structure.

The flexibility in constituency that the FNQ construction in Japanese exhibits may be somewhat surprising from a purely syntactic perspective. However, when we consider FNQ interpretation, the flexibility that is admitted is not really surprising, but necessary. This is because the appropriate structural assignment (needed for semantic interpretation) can be signalled in Japanese by prosody as well as by context; without such prosodic indication, the strings in question are often judged to be unacceptable (or ungrammatical) (as discussed in Chapters 2-4). The CCG-based account of FNQ constructions offers a successful theory of relation between prosody and information structure. We have provided experimental confirmation (discussed in section 5.4 (Chapter 5)) that prosodic information is essential to sustaining the CCG presumption of prosody, category assignment, and flexible derivational constituency.

In generative syntax, syntactic architecture is proposed as corresponding to some ideal speaker's knowledge of language without any reference to context. Hence, context-sensitive aspects of natural language syntax have generally been regarded as having nothing to do with the native speaker's innate linguistic ability, often referred to as competence (or I-language). However, Wasow (2002) and Hawkins (2004) among others have argued that what is regarded as performance data are indeed the reflection of linguistic competence. The current proposal is in line with theirs.

6.6 Summary

We have offered in this chapter a formal analysis of the treatment of Japanese FNQ interpretation in a CCG framework. While previous studies have demonstrated empirical shortcomings in the analysis of FNQ constructions, as discussed in the preceding chapters, the present study offers a possible solution to these problems by using CCG. We have proposed two types of categories for Japanese FNQs. The characterization of NP-related FNQ construal is particularly significant, as it is based on the parallelism between anaphoric pronouns and NP-related FNQs. We have shown that the two functions of FNQs correspond to distinct scope interpretations and pragmatic functions. The derivations within lexicalist grammar frameworks including CCG show a step-wise combination by making the most of type-raising mechanisms and by putting modal control in the lexicon without stipulation (see section 6.4). The possibility of nonstandard constituents and multiple possible constituent structures for a sentence requires a great deal of flexibility in a syntactic theory. The proposed CCG analysis of FNQ constructions offers such flexibility that can capture straightforwardly the reality that the two readings of FNQs in Japanese can be disambiguated by both intonation and the information structure associated with the intonation.

CHAPTER 7

Conclusion

The analysis of Japanese FNQ constructions developed in the present study has suggested that if we are to understand the nature of FNQ interpretation, it is necessary to consider prosody, which provides important indications of information structure but has been overlooked by previous studies.

More specifically, while syntax offers the possible positions in which an FNQ occurs, prosody determines in which of these locations the FNQ will appear. When an FNQ with marked (or non-default) prosody, which the literature judges as unacceptable, occurs in a phonologically less preferred position, it is perceived as degraded but still acceptable (as discussed in Chapters 4 and 5). This acceptability indicates that the approaches taken in the past have taken too little account of empirical evidence.

In the discussion in earlier chapters, we have pointed out potential problems with previous studies: Examples involving FNQs in existing research are provided without context. Without context, it is highly likely that listeners will tend to determine the information structure roles of the subject and the verbal predicate differently, which can influence the prosodic contour and interpretation. In addition, the tests relying on data in a written mode conducted in earlier studies reflect only the parsers' default prosody (i.e., VP-related FNQs). In such reading tests, marked prosody cannot be accommodated immediately (see Kiaer 2005; Kitagawa and Fodor 2006 for a related discussion).[161]

To tackle this problem, we have suggested that Japanese possesses two types of FNQs (NP-related and VP-related FNQs), both of which are motivated

[161] What emerges from this observation is that different prosodic phrasing is the source of the two different structure-building options in on-line parsing (see Kempson et al. 2001; Kiaer 2005, and references therein).

and distinguished syntactically and semantically. (Reasons for the distinction are given in Chapter 4.) Due to this dual nature of FNQ structures, we can see that all cases involving FNQs are potentially ambiguous (in a written mode), offering both an event-quantifier reading (i.e., a VP-related FNQ) and an object-quantifier reading (i.e., an NP-related FNQ). The results of the comprehension test clearly indicate that phonology is sensitive to information structure, which can be seen as mediating between phonology and syntax.

We have discussed the results of the comprehension test in detail (section 5.4 (Chapter 5)). The test determined that the two kinds of FNQs were distinguished intonationally and intepretationally. The key point is whether the FNQ belongs to the same prosodic unit as the subject NP or the VP it is modifying. To account for the distinctive pitch patterns, we have proposed two levels of prosodic phrasing in FNQ constructions: the accentual phrase (AP) and the intermediate phrase (IP). The test results ascertained that the syntax does not unambiguously determine (or predict) the intonational contour. Specifically, the pause observed between the subject noun and the NP-related FNQ should be treated as an AP-boundary tone rather than an IP-boundary tone, because it does not seem to be generally followed by pitch-resetting. We then concluded that the difference in phrasing is insensitive to the edges of major syntactic phrases but is sensitive to a (higher) level difference (in the prosodic structural hierarchy, e.g., AP or IP). In light of these observations, the problems with FNQ interpretation can be reduced to a matter of structure and intonation.

Unlike earlier studies based on the researcher's intuition, this study included an analysis of the FNQ construction conducted from another point of view. A comprehension experiment empirically confirmed the assumption that NP-related and VP-related FNQ sentences can be distinguished by prosody. Although a single case study might not provide an overall picture of this grammatical phenomenon at the syntax-phonology interface, this study suggests how prosodic and contextual information affect the way structurally ambiguous sentences in Japanese are understood when spoken.

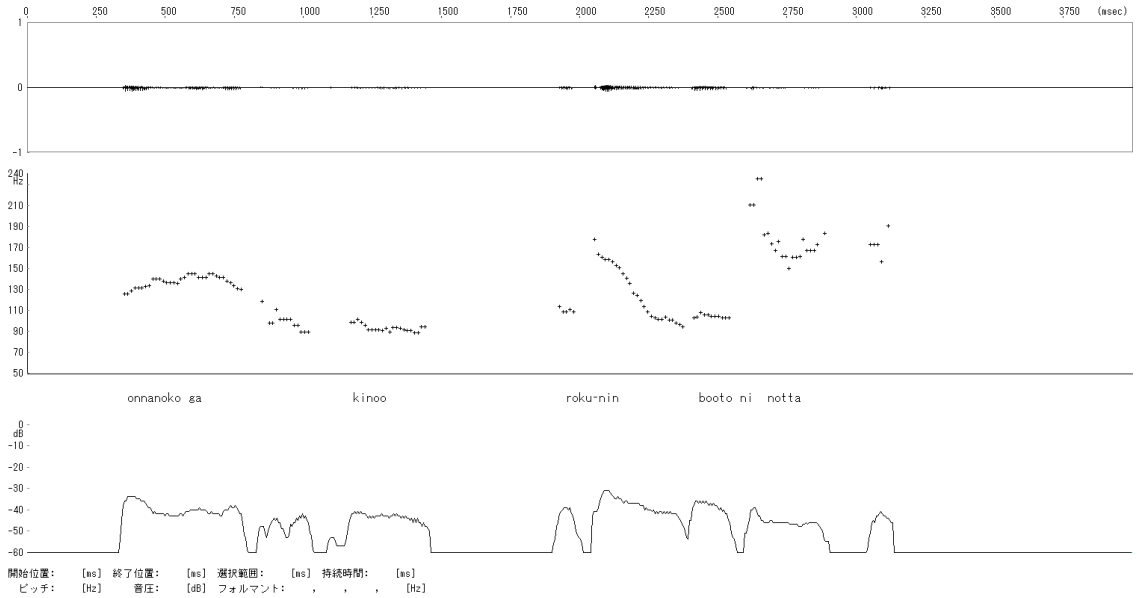
It has sometimes been claimed that FNQs are always asserted (or focused), while subject NPs are presupposed (or given) (Takami 1998, and Hatori 2002). However, in the present study, closer inspection of the two uses of FNQs has revealed that subject NPs are often not presupposed and that prosody marks the difference. We have also indicated that the NP-related FNQs seem much more like anaphoric pronouns and appear to be grouped prosodically with the preceding subject NP, rather than with the following VP (as we saw in Chapter 5). This particular intonation, observed in the NP-related FNQ sentences presumably represents a discourse pattern used to manipulate the flow of information in the discourse. Importantly, in the NP-related FNQ sentence, the fragment [Subject NP, FNQ] can function anaphorically in a single prosodic domain, signaling that the semantic association of an FNQ with the host noun is conducted within the nominal domain (giving rise to the object-related-quantifier reading). When it comes to a VP-related FNQ construction, it exhibits a different prosodic pattern in which the FNQ is grouped prosodically with the following verb phrase (giving rise to the event-related-quantifier reading).

Finally, in Chapter 6, we proposed a formal analysis of the two types of Japanese FNQs, identified by different prosodic patterns, in Combinatory Categorial Grammar (CCG) (Steedman 1996, 2000a, b, 2012; Steedman and Baldridge 2011). This approach can serve as a useful framework for the present syntactico-prosodic analysis that straightforwardly captures both information structure and prosody. In the past, syntax and semantics on the one hand and phonology and discourse information on the other appeared to demand conflicting structural analyses and to require processing more or less separately. However, within the framework of CCG, we have seen that syntax alone cannot predict the use of an FNQ, while prosody (in relation to information structure) can. Both syntax and prosody, thus, are shown to contribute to the disambiguation and acceptability of the FNQ sentence in Japanese.

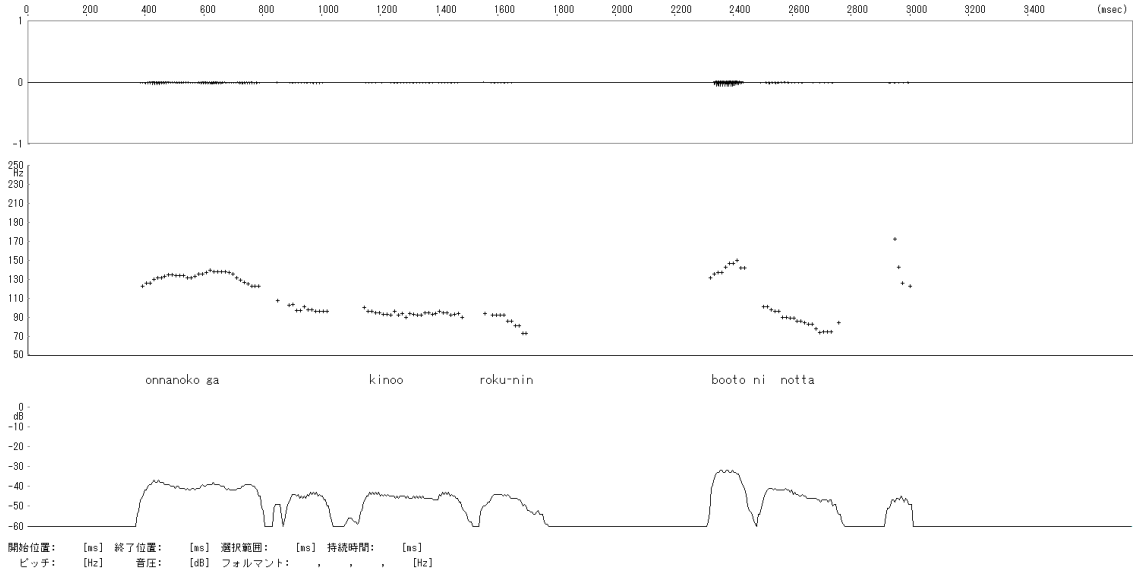
APPENDICES

Appendix A: Pitch contours for the material sentences

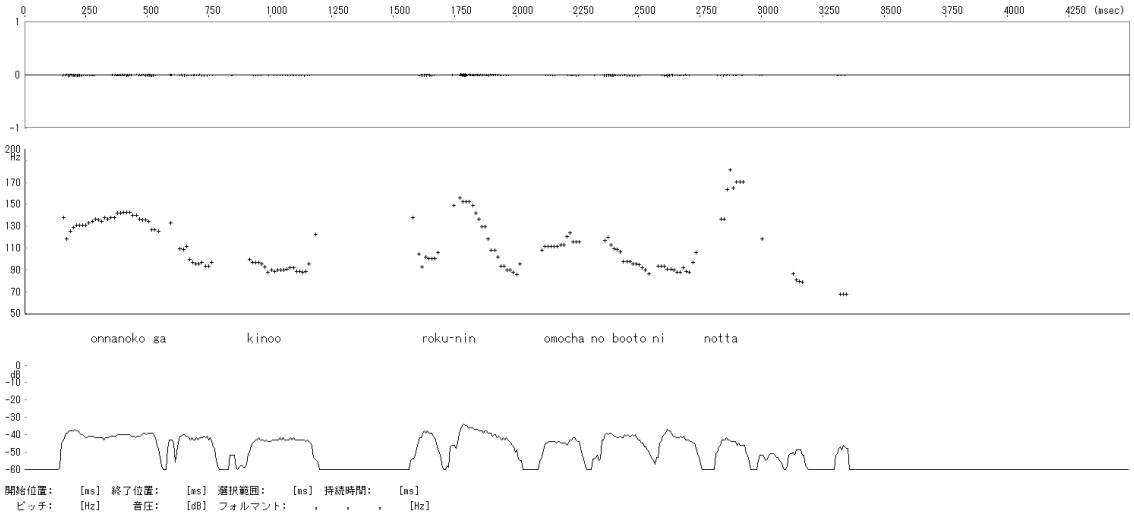
(T1) a



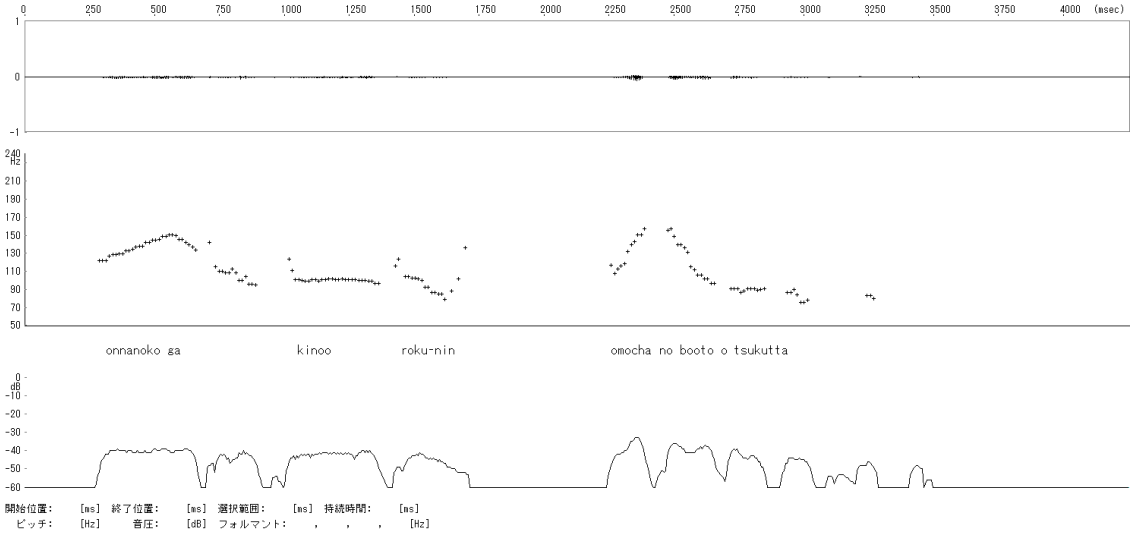
(T1) b



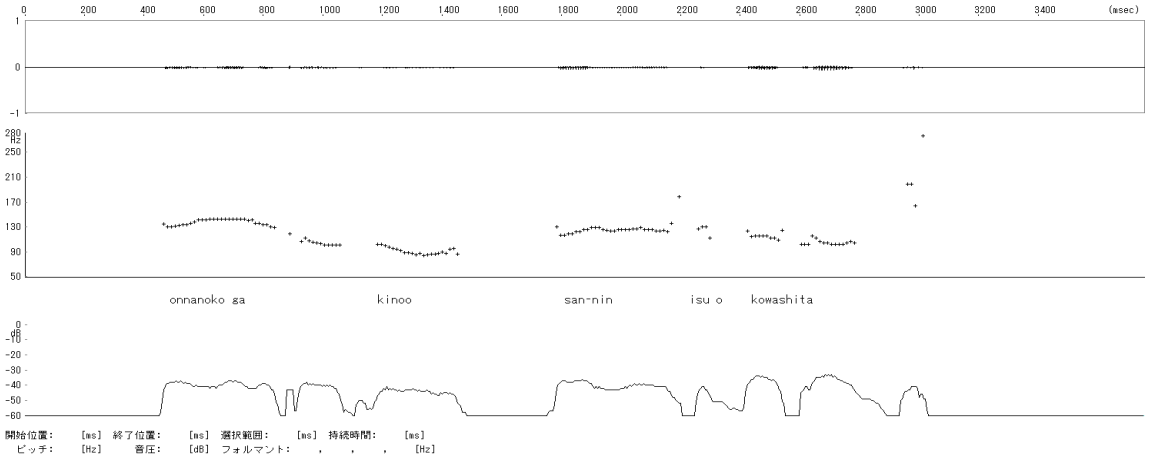
(T2) a


onnanoko ga
kinoo
roku-nin
omocha no booto ni
notta
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

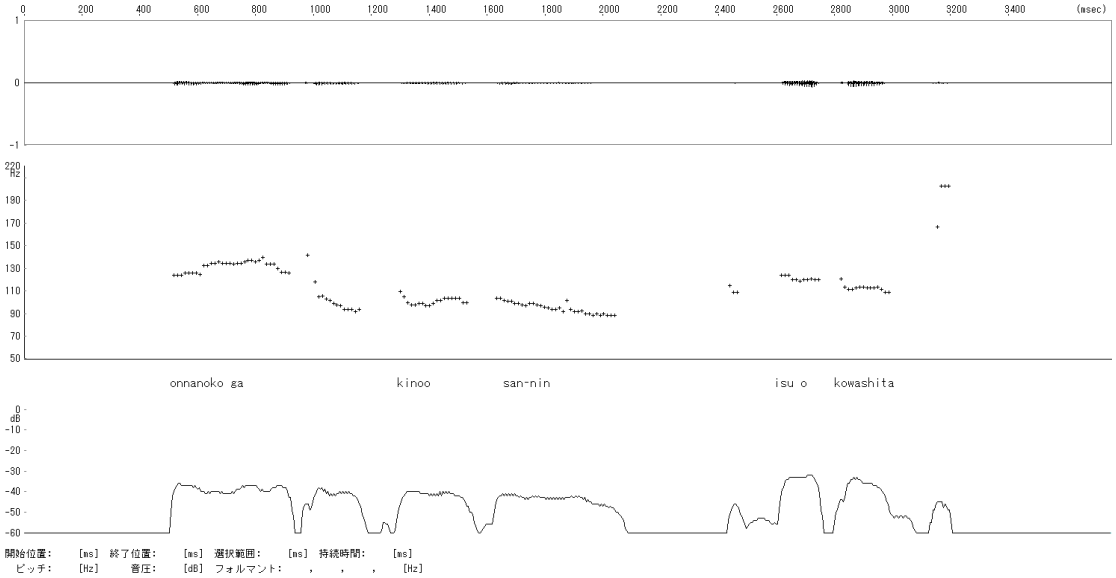
(T2) b


onnanoko ga
kinoo
roku-nin
omocha no booto o tsukutta
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

(T3) a

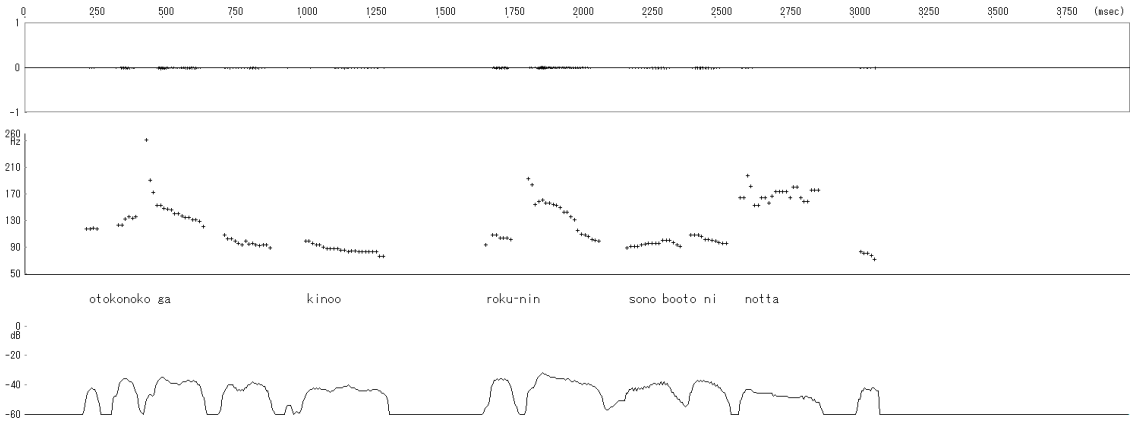

onnanoko ga
kinoo
san-nin
isu o
kowashita
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

(T3) b



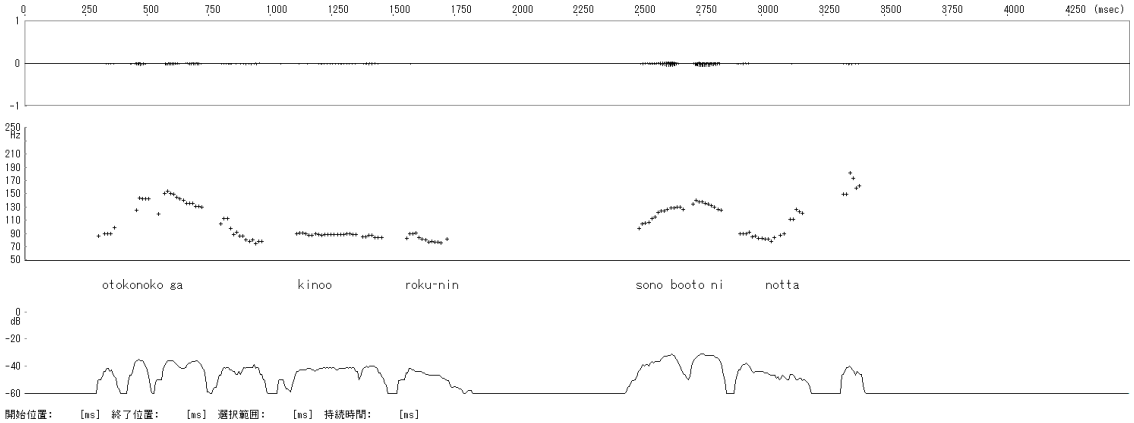
開始位置:　[ms]　終了位置:　[ms]　選択範囲:　[ms]　持続時間:　[ms]
ピッチ:　[Hz]　音圧:　[dB]　フォルマント:　,　,　,　[Hz]

(T4) a



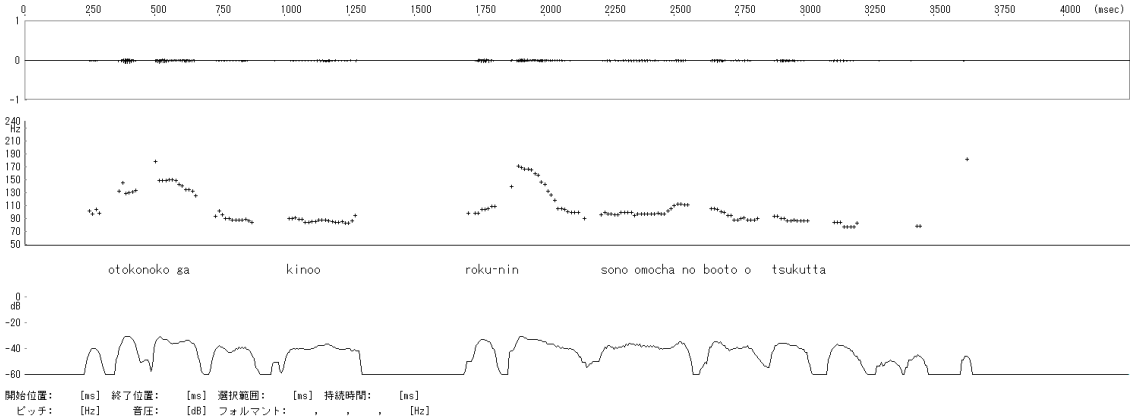
開始位置:　[ms]　終了位置:　[ms]　選択範囲:　[ms]　持続時間:　[ms]
ピッチ:　[Hz]　音圧:　[dB]　フォルマント:　,　,　,　[Hz]

(T4) b

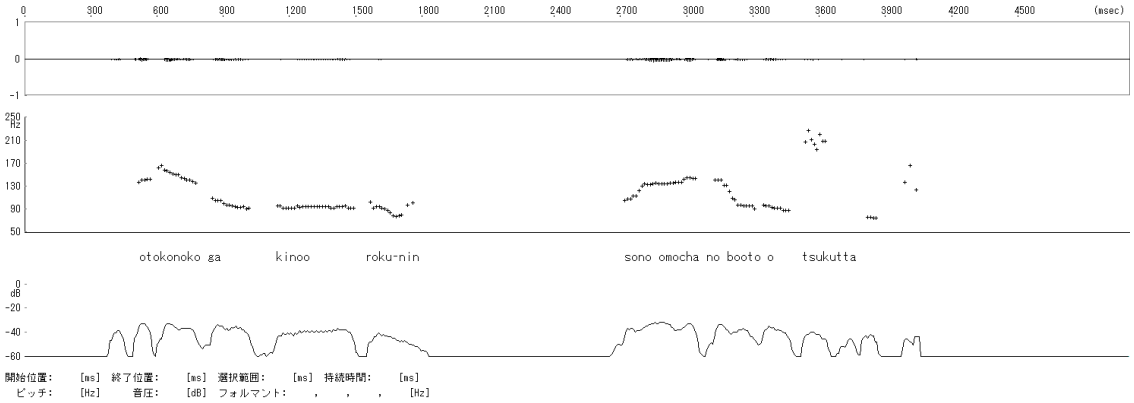


開始位置:　[ms]　終了位置:　[ms]　選択範囲:　[ms]　持続時間:　[ms]
ピッチ:　[Hz]　音圧:　[dB]　フォルマント:　,　,　,　[Hz]

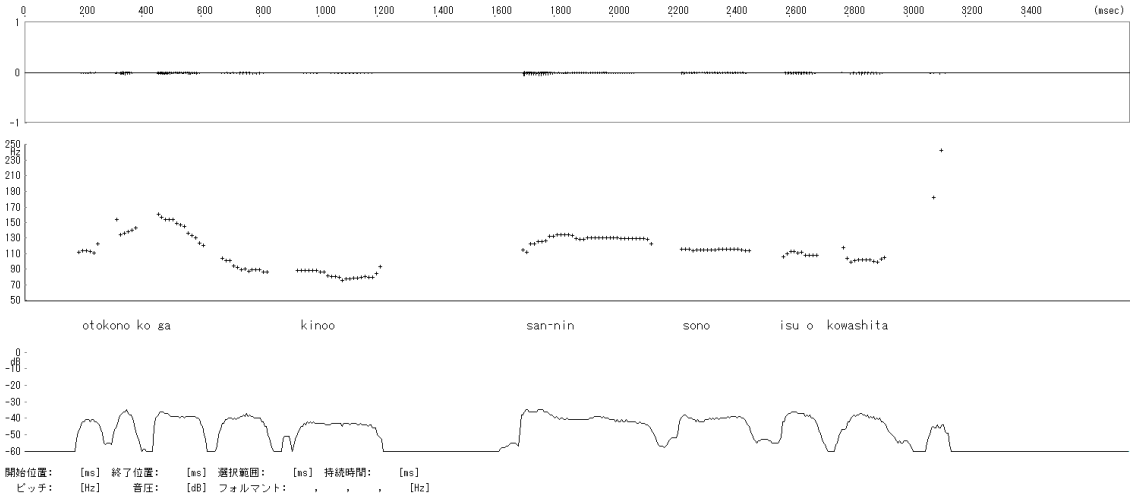
(T5) a


0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 4000 (msec)
otokonoko ga
kinoo
roku-nin
sono omocha no booto o
tsukutta
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

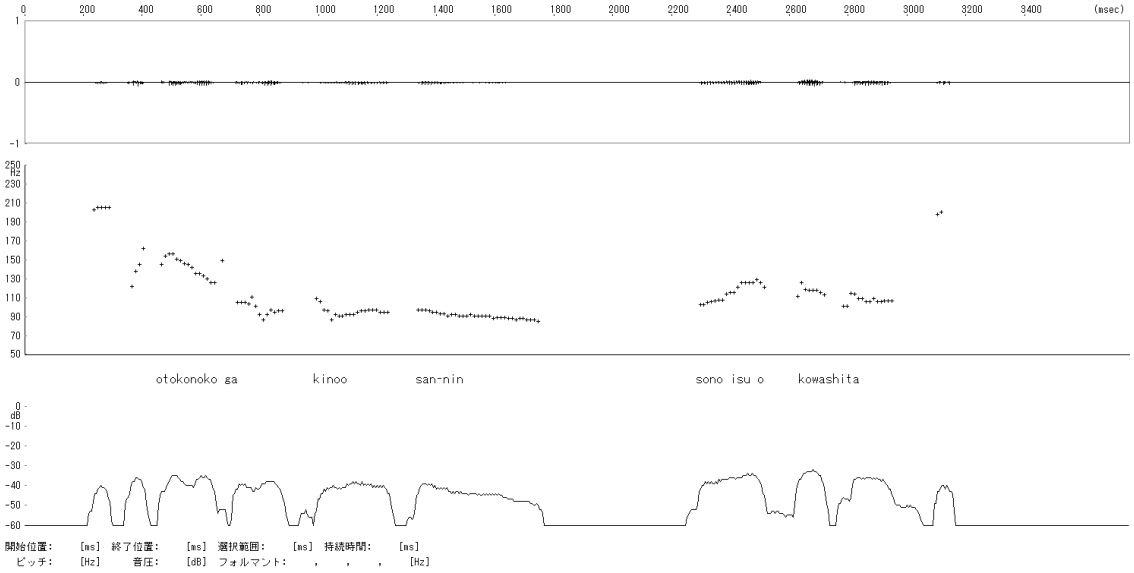
(T5) b


0 300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600 3900 4200 4500 (msec)
otokonoko ga
kinoo
roku-nin
sono omocha no booto o
tsukutta
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

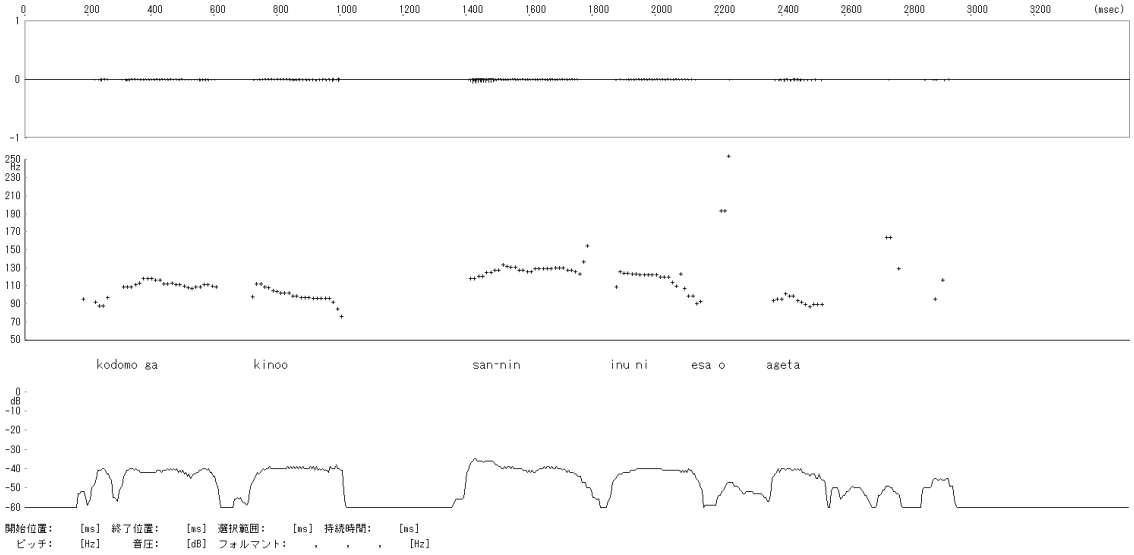
(T6) a


0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 (msec)
otokono ko ga
kinoo
san-nin
sono
isu o kowashita
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

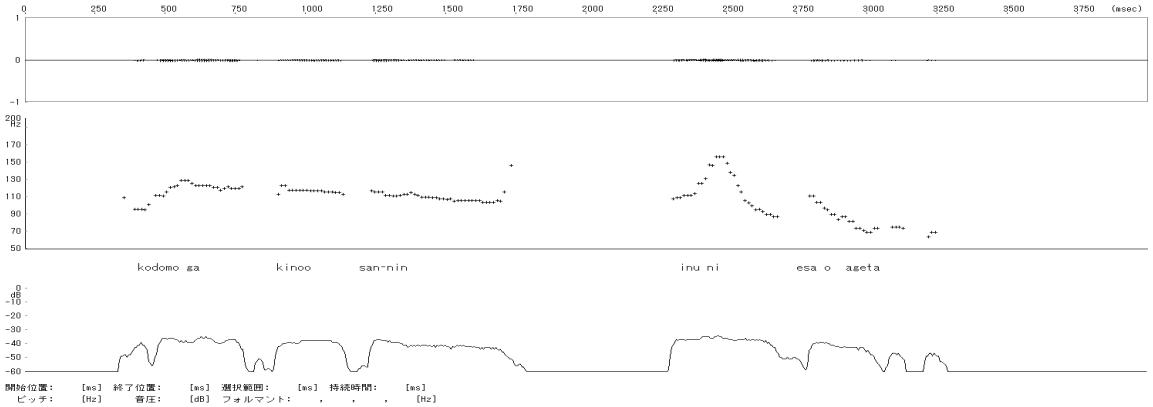
(T6) b


0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 (msec)
Hz
otokonoko ga
kinoo
san-nin
sono isu o
kowashita
dB
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

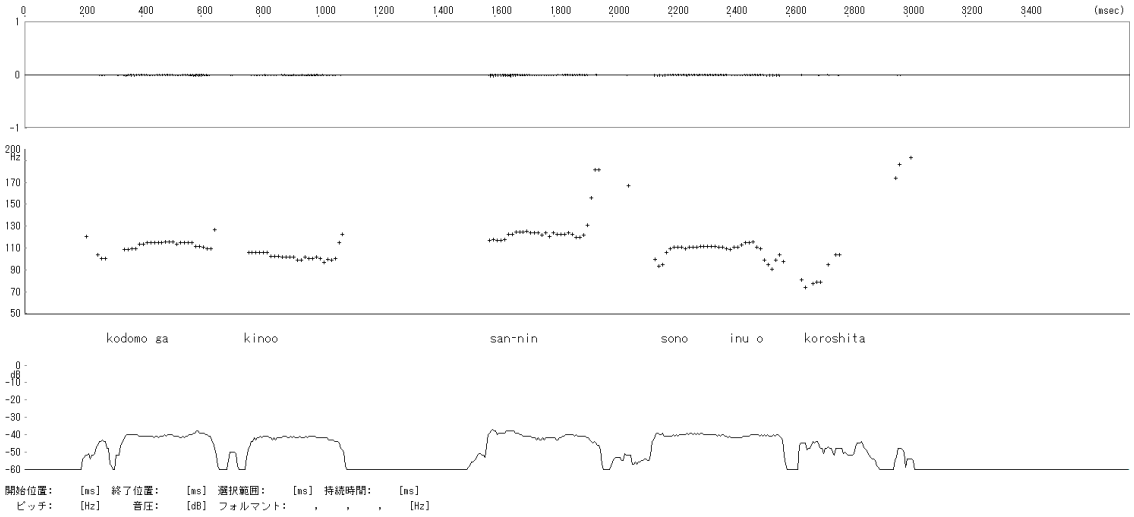
(T7) a


0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 (msec)
Hz
kodomo ga
kinoo
san-nin
inu ni
esa o
ageta
dB
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

(T7) b

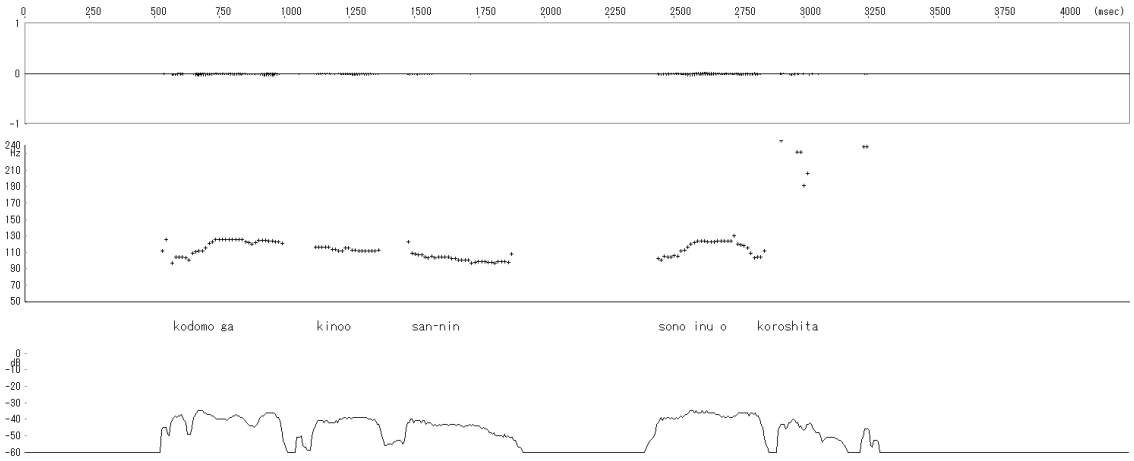

0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 (msec)
Hz
kodomo ga
kinoo
san-nin
inu ni
esa o
ageta
dB
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

(T8) a



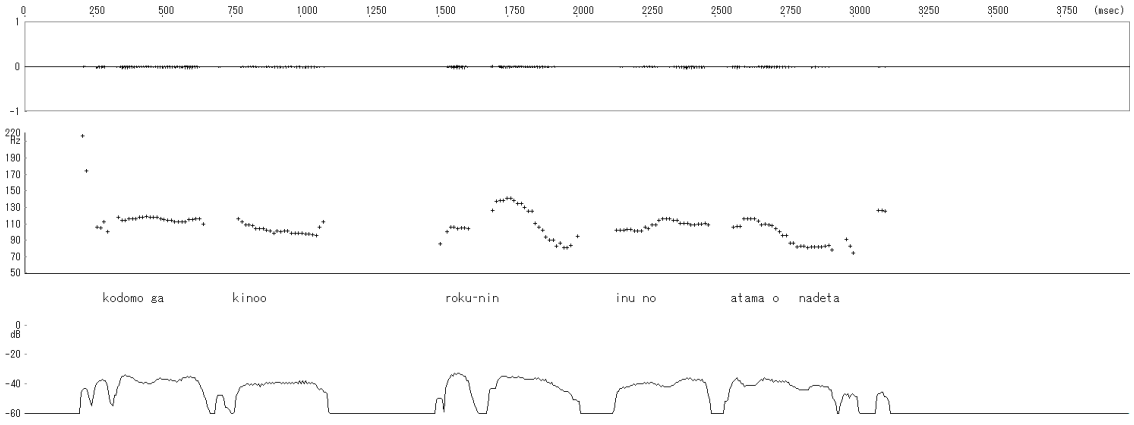
開始位置:　[ms] 終了位置:　[ms] 選択範囲:　[ms] 持続時間:　[ms]
ピッチ:　[Hz]　音圧:　[dB] フォルマント:　,　,　,　[Hz]

(T8) b



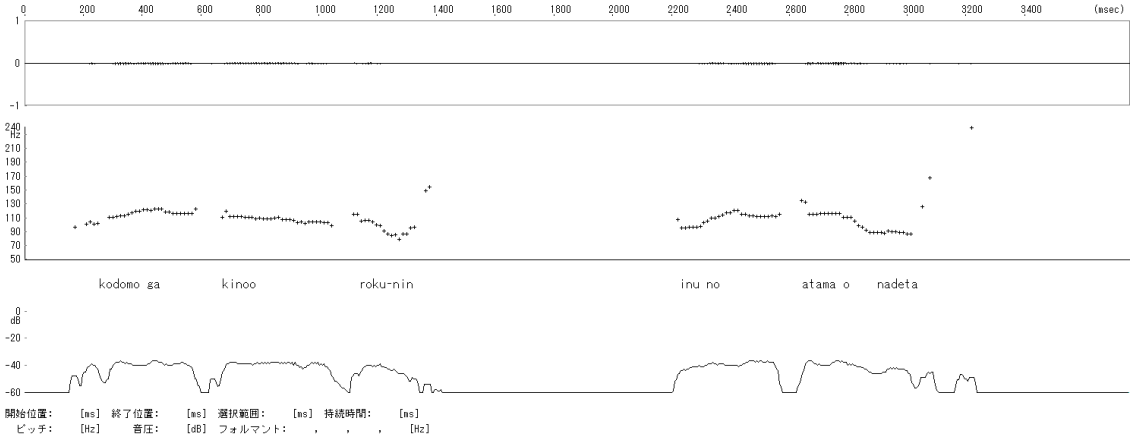
開始位置:　[ms] 終了位置:　[ms] 選択範囲:　[ms] 持続時間:　[ms]
ピッチ:　[Hz]　音圧:　[dB] フォルマント:　,　,　,　[Hz]

(T9) a



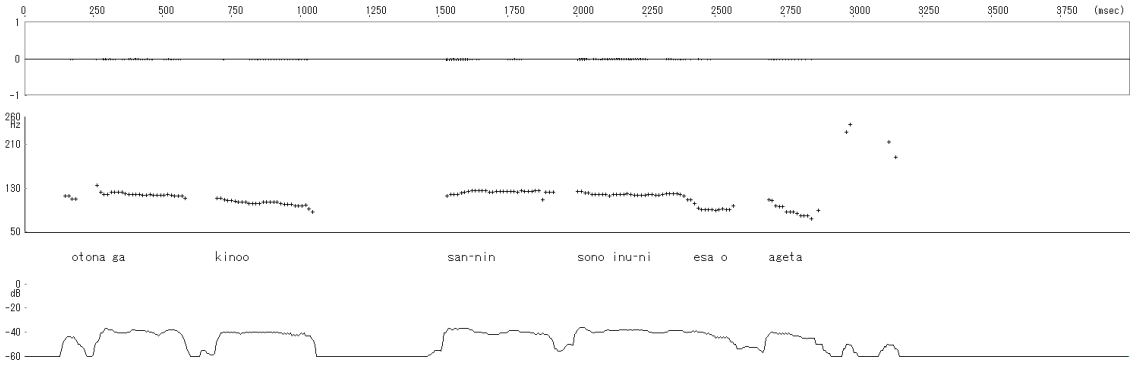
開始位置:　[ms] 終了位置:　[ms] 選択範囲:　[ms] 持続時間:　[ms]
ピッチ:　[Hz]　音圧:　[dB] フォルマント:　,　,　,　[Hz]

(T9) b



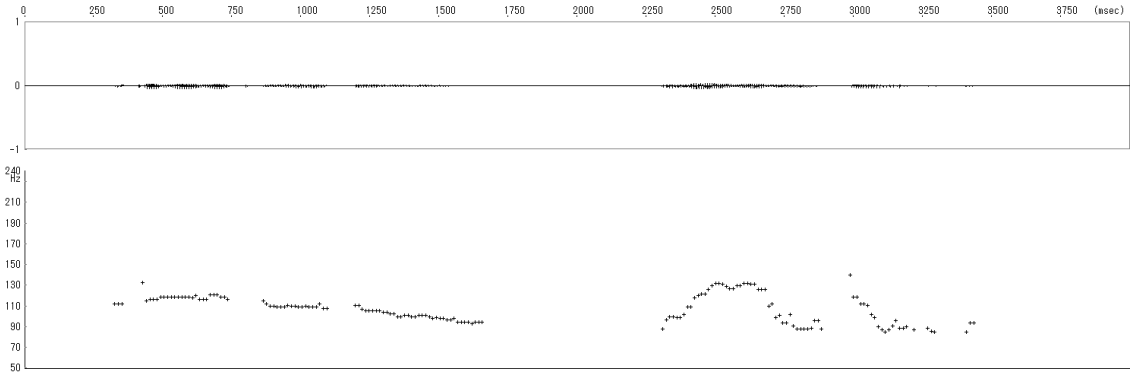
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

(T10) a



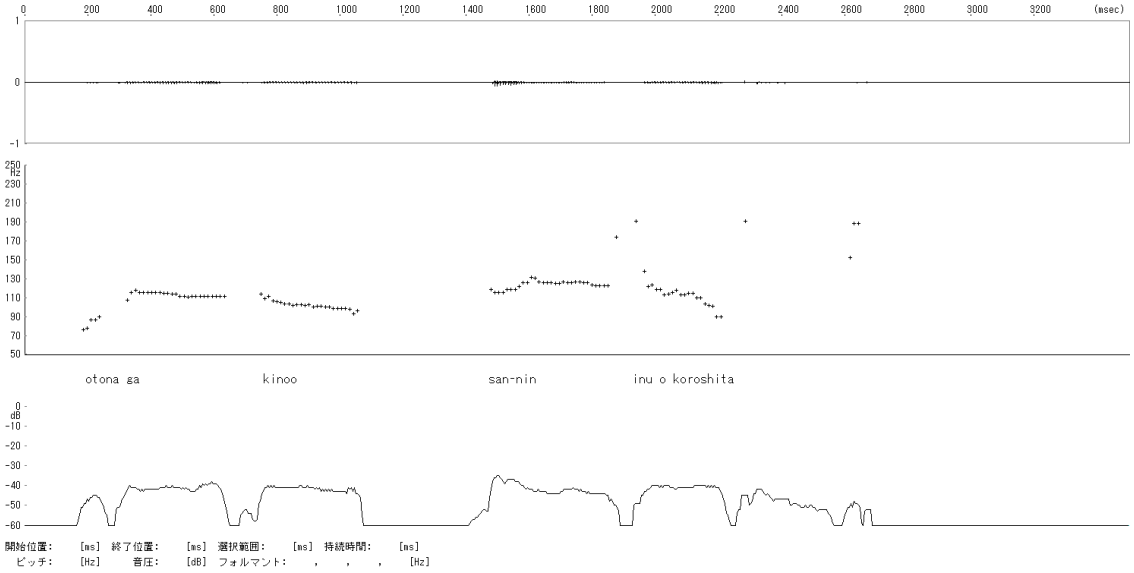
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

(T10) b

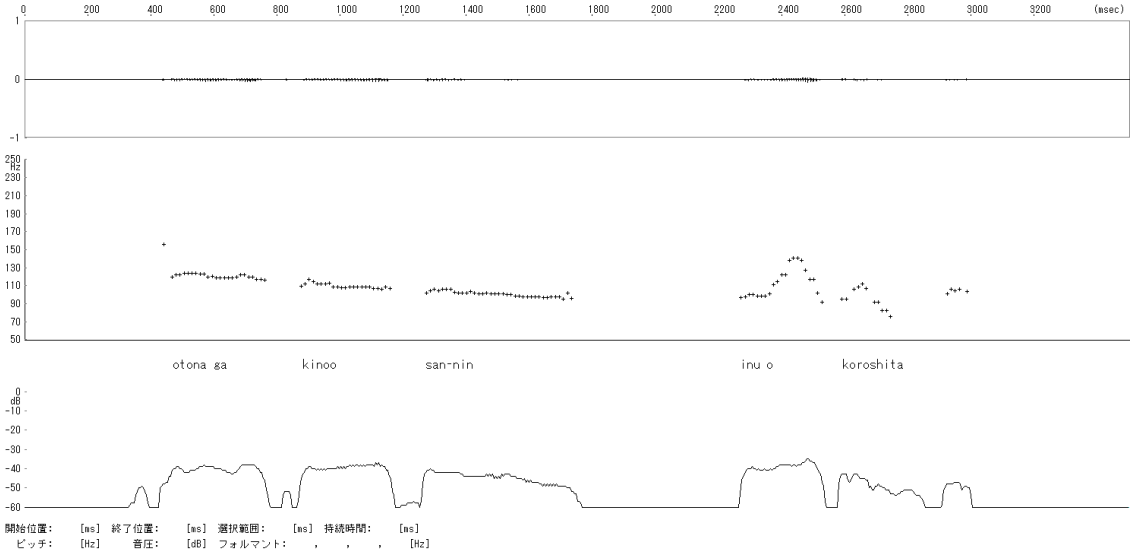


開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

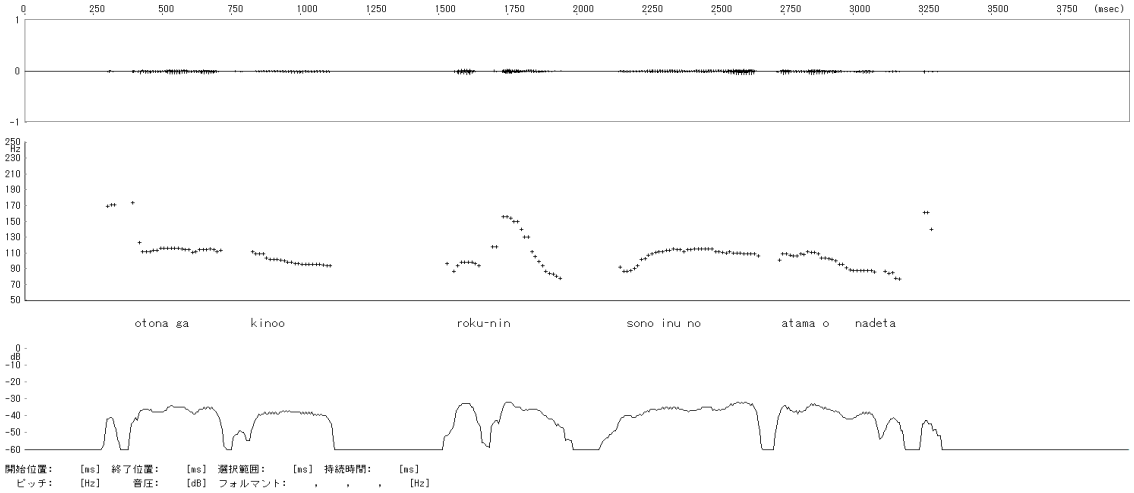
(T11) a


0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 (msec)
otona ga
kinoo
san-nin
inu o koroshita
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

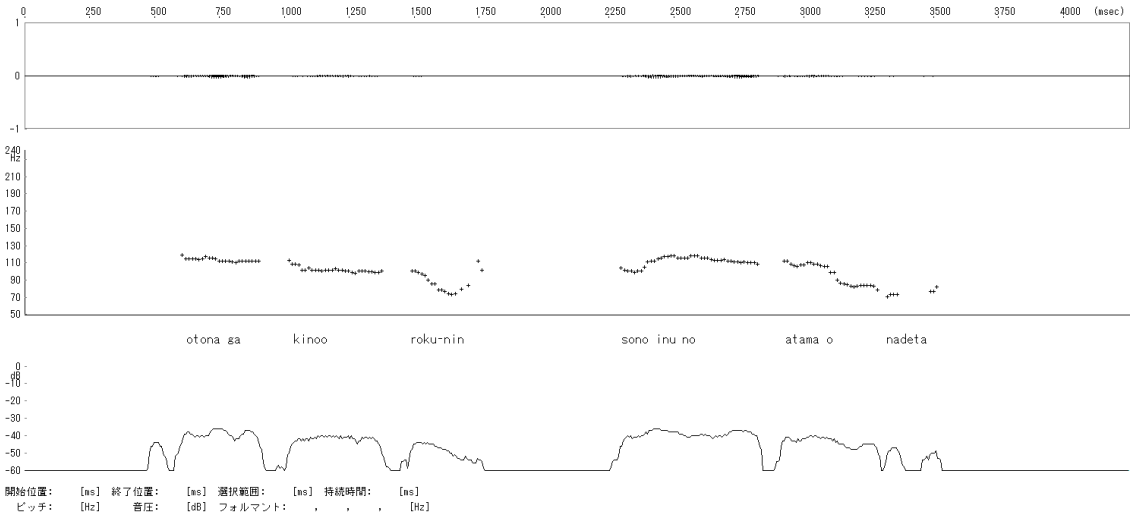
(T11) b


0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 (msec)
otona ga
kinoo
san-nin
inu o
koroshita
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

(T12) a


0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 (msec)
otona ga kinoo roku-nin sono inu no atama o nadeta
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

(T12) b


0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 4000 (msec)
otona ga kinoo roku-nin sono inu no atama o nadeta
開始位置: [ms] 終了位置: [ms] 選択範囲: [ms] 持続時間: [ms]
ピッチ: [Hz] 音圧: [dB] フォルマント: , , , [Hz]

Appendix B: Test sheet

日本語の文を聞いてください。そのあと、その文の意味について、正しいと思うものを①、②からひとつ選んでください。

(T 1)

a. [①６人がいっしょに乗った　②６人がそれぞれ別々に乗った]

b. [①６人がいっしょに乗った　②６人がそれぞれ別々に乗った]

(T 2)

a. [①６人がいっしょに作った　②６人がそれぞれ別々に作った]

b. [①６人がいっしょに作った　②６人がそれぞれ別々に作った]

(T 3)

a. [①３人がいっしょに壊した　②３人がそれぞれ別々に壊した]

b. [①３人がいっしょに壊した　②３人がそれぞれ別々に壊した]

(T 4)

a. [①６人がいっしょに乗った　②６人がそれぞれ別々に乗った]

b. [①６人がいっしょに乗った　②６人がそれぞれ別々に乗った]

(T 5)

a. [①６人がいっしょに作った　②６人がそれぞれ別々に作った]

b. [①６人がいっしょに作った　②６人がそれぞれ別々に作った]

(T 6)

a. [①３人がいっしょに壊した　②３人がそれぞれ別々に壊した]

b. [①３人がいっしょに壊した　②３人がそれぞれ別々に壊した]

(T 7)

a. [①３人がいっしょにあげた　②３人がそれぞれ別々にあげた]

b. [①３人がいっしょにあげた　②３人がそれぞれ別々にあげた]

(T 8)

a. [①３人がいっしょに殺した　②３人がそれぞれ別々に殺した]

b. [①３人がいっしょに殺した　②３人がそれぞれ別々に殺した]

(T 9)

a. [①６人がいっしょになでた　②６人がそれぞれ別々になでた]

b. [①６人がいっしょになでた　②６人がそれぞれ別々になでた]

(T 10)

a. [①３人がいっしょにあげた　②３人がそれぞれ別々にあげた]

b. [①３人がいっしょにあげた　②３人がそれぞれ別々にあげた]

(T 11)

a. [①３人がいっしょに殺した　②３人がそれぞれ別々に殺した]

b. [①３人がいっしょに殺した　②３人がそれぞれ別々に殺した]

(T 12)

a. [①６人がいっしょになでた　②６人がそれぞれ別々になでた]

b. [①６人がいっしょになでた　②６人がそれぞれ別々になでた]

———————————————————————————————————

REFERENCES

Abbot, Barbara. 2008. Issues in the semantics and pragmatics of definite descriptions in English. In J. K. Gundel and N. Hedberg, eds., *Reference: Interdisciplinary Perspectives*, pages 61-72. Oxford: Oxford University Press.

Abbott, Barbara. 2010. *Reference*. Oxford: Oxford University Press.

Ades, Anthony and Mark Steedman. 1982. On the order of words. *Linguistics and Philosophy* 4: 517-558.

Amazaki, Osamu. 2005. *A Functional Analysis of Numeral Quantifier Constructions in Japanese*. Doctoral dissertation, State University of New York at Buffalo.

Bach, Emmon, Eloise Jelinek, Angelika Kratzer and Barbara Partee, eds., 1995. *Quantification in Natural Languages*. Dordrecht: Kluwer.

Baldridge, Jason. 2002 *Lexically Specified Derivational Control in Combinatory Categorial Grammar*. Doctoral dissertation, University of Edinburgh.

Barwise, John and Robin Cooper. 1981. Generalized quantifiers and natural languages. *Linguistics and Philosophy* 4: 159-219.

Bäuerle, Rainer, Christoph Scwarze and Armin von Stechow, eds., 1983. *Meaning, Use, and Interpretation of Language.* Berlin: Mouton de Gruyter.

Beaver, David I., Brady Clark, Edward Stanton Flemming, Florian Jaeger and Maria Wolters, T. 2007. When semantics meets phonetics: Acoustical studies of second-occurrence focus. *Language* 83(2): 245-276.

Beckman, Mary E. 1996. The parsing of prosody. *Language and Cognitive Processes* 11(1) & (2): 17-68.

Beckman, Mary E and Janet Pierrehumbert. 1986. Intonational structure in Japanese and English. *Phonology Yearbook* 3: 255-309.

Beghelli, Fillippo and Tim Stowell. 1997. The syntax of distributivity and negation. In Anna Szabolcsi, ed., *Ways of Scope Taking*, pages 71-108 Dordrecht: Reidel.

Belletti, Adriana. 2003. Extended doubling and the VP periphery. Ms., University of Siena.

Birner, Betty J. and Gregory Ward. 1998. *Information Status and Noncanonical Word Order in English*. Philadelphia, PA: John Benjamin's.

Blodgett, Allison. 2004. Functions of intonation boundaries during spoken language comprehension in English. *Proceedings for the 8th International Conference on Spoken Language Processing*, pages 1-4.

Blutner, Reinhard. 2000. Some aspects of optimality in natural language interpretation. *Journal of Semantics* 17: 189-216.

Bolinger, Dwight L. 1965. *Pitch Accent and Sentence Rhythm, Forms of English: Accent, Morpheme, Order.* Cambridge, MA: Harvard University Press.

Bolinger, Dwight L. 1968. Judgments of grammaticality. *Lingua* 21: 34-40.

Bolinger, Dwight L. 1972. Accent is predictable (if you're a mind reader). *Language* 48: 633-44.

Bolinger, Dwight L. 1989. *Intonation and Its Uses: Melody in Grammar and Discourse*. Stanford, CA: Stanford University Press.

Bonami, Olivier and Danièle Godard. 2007. Parentheticals in underspecified semantics: the case of evaluative adverbs. *Research on Language and Computation* 5(4): 391-413.
Bošković, Zeliko. 2004. Be careful where you float your quantifiers. *Natural Language and Linguistic Theory* 22: 681-742.
Brisson, Christine M. 1998. *Distributivity, Maximality, and Floating Quantifiers*. Doctoral dissertation, The State University of New Jersey, Rutgers.
Brown, Gillian. 1983. Prosodic structure and the given/new distinction. In A. Cutler, D. R. Ladd and G. Brown, eds., *Prosody: Models and Measurements*, pages 66-77. Berlin: Springer-Verlag.
Brunetti, Lisa. 2003, 'Information' focus movement in Italian and contextual constraints on ellipsis. In G. Garding and L. M. Tsujimura, eds., Proceedings of *West Coast Conference in Formal Linguistics (WCCFL) 22*, pages 95-108. Somerville, MA: Cascadilla Press.
Büring, Daniel. 1997. *The Meaning of Topic and Focus: The 59th Street Bridge Accent*. London/New York: Routledge.
Büring, Daniel. 2008. Semantics, intonation, and information structure. In G. Ramchand and C. Reiss, eds., *The Oxford Handbook of Linguistic Interfaces*, pages 445-473. Oxford: Oxford University Press.
Butt, Mirium, and Tracy Holloway King. 2000. Null elements in discourse structure. In K. V. Subbarao, ed., *Papers from the NULLS Seminar*. Delhi: Motilal Banarsidass.
Cann, Ronnie, Ruth Kempson and Eleni Gregoromichelaki. 2009. *Semantics: An Introduction to Meaning in Language*. Cambridge: Cambridge University Press.
Carlson, Gregory N. and Francis Jeffery Pelletier, eds., 1995. *The Generic Book*. Chicago, IL: The University of Chicago Press.
Carnie, Andrew. 2008. *Constituent Structure*. Oxford: Oxford University Press.
Chafe, Wallace L. 1976. Givenness, contrastiveness, definiteness, subjects, topics, and point of view. In N, L. Charles, ed., *Subject and Topic*, pages 25-55. New York: Academic Press.
Chafe, Wallace. 1994. *Discourse, Consciousness and Time: The Flow and Displacement of Conscious Experience in Speaking and Writing*. Chicago, IL: University of Chicago Press.
Chierchia, Gennaro. 1995. *Dynamics of Meaning*. Chicago, IL: University of Chicago Press.
Chierchia, Gennaro. 1998a. Reference to kinds across languages. *Natural Language Semantics* 6: 339-405.
Chierchia, Gennaro. 1998b. Plurality of mass nouns and the notion of 'semantic parameter'. In S. Rothstein, ed., *Events and Grammar*, pages 53-103. Dordrecht: Kluwer.
Chierchia, Gennaro. 2005. Definites, locality, and intentional identity. In G. N. Carlson and F. J. Pelletier, eds., *Reference and Quantification: The Partee Effect*, pages 143-177. Stanford, CA: CSLI Publications.
Chomsky, Noam. 1971. Deep structure, surface structure, and semantic interpretation. In D. Steinberg, and L. Jakobovits, eds., *Semantics. An Interdisciplinary Reader in Philosophy, Linguistics and Psychology,* pages

83-216. Cambridge: Cambridge University Press.
Chomsky, Noam. 1995. *The Minimalist Program*. Cambridge, MA: MIT Press.
Chomsky, Noam and Morris Halle. 1968. *The Sound Pattern of English*. New York: Harper & Row.
Cinque, Guglielmo. 1993. A null theory of phrase and compound stress. *Linguistic Inquiry* 24: 239-97.
Clark, Herbert H, and Thomas Wasow. 1998. Repeating words in spontaneous speech. *Cognitive Psychology* 84: 73-111.
Clark, John, Colin Yallop and Janet Fletcher. 1995. *An Introduction to Phonetics and Phonology.* Cambridge: Blackwell.
Copestake, Ann, Dan Flickinger, Carl Pollard, and Ivan A. Sag. 1998. Minimal recursion semantics: an introduction. MS., Stanford University.
Cowart, Wayne. 1997. *Experimental Syntax –Applying Objective Methods to Sentence Judgments*. London: Sage Publications.
Cresti, Diana. 1995. *Indefinite Topics*. Doctoral dissertation, MIT.
Cresswell, Maxwell John. 1973. *Logics and Languages*. London: Methuen.
Cresswell, Maxwell John. 1985. *Structured Meanings*. Cambridge: Cambridge University Press.
Dalrymple, Mary and Irina Nikolaeva. 2010. *Objects and Information Structure*. Cambridge: Cambridge University Press.
Davidson, Donald. 1967. Truth and meaning. *SYNTHESE* 17(1): 304-323.
Deguchi, Masanobu and Kitagawa Yoshihisa. 2002. Prosody and Wh-questions. In M. Hirotani, ed., *Proceedings of the North East Linguistics Society (NELS) 1*, pages 73-92.
Dekker, Paul and Robert Van Rooy. 2000. Bi-directional optimality theory: an application of game theory. *Journal of Semantics* 17(3): 217-242.
Denny, Peter J. 1986. The semantic role of noun classifiers. In C. Craig, ed., *Noun Classes and Categorization*, pages 345-375. Amsterdam/Philadelphia: John Benjamin's.
Diesing, Molly. 1992. *Indefinites*. Cambridge, MA: MIT Press.
Downing, Bruce T. 1970. *Syntactic Structure and Phonological Phrasing in English*. Doctoral dissertation, University of Texas at Austin.
Downing, Pamera. 1984. *Japanese Numeral Classifiers: A Syntactic, Semantic, and Functional Profile*. Doctoral dissertation. University of California, Berkeley.
Downing, Pamela A. 1993. Pragmatic and semantic constraints on numeral quantifier position in Japanese. *Journal of Linguistics* 19. 65-93.
Downing, Pamela A. 1996. *Numeral Classifier Systems: The Case of Japanese*. Amsterdam: John Benjamin's.
Dowty, David. 1987. Collective predicates, distributive predicates, and *all*. In F. Marshall, A. Miller and Z. Zhang, eds., *Proceedings of Eastern States Conference on Linguistics (ESCOL) '86*, pages 97-115. Columbus: Ohio State University.
Dowty, David and Belinda Brodie. 1984. The semantics of 'floated' quantifiers in a transformationless grammar, *Proceedings of West Coast Conference in Formal Linguistics (WCCFL) 3*, pages 75-90.
Dryer, Matthew. 1996. Focus, pragmatic presupposition, and activated propositions. *Journal of Pragmatics* 26: 475-523.

Du Bois, John W. 1987. The discourse basis of ergativity. *Language* 63(4): 805-855.
Enç, Mürvet. 1991. The semantics of specificity. *Linguistic Inquiry* 22(1): 1-25.
Engdahl, Elisabet and Enric Valldúvi. 1996. Information packaging in HPSG. In G. Grover and E. Valldúvi, eds., *Edinburgh Working Papers in Cognitive Science, Vol. 12: Studies in HPSG*, pages 1-31.
Erteschik-Shir, Nomi. 1997. *The Dynamics of Focus Structure*. Cambridge: Cambridge University Press.
Erteschik-Shir, Nomi. 2007. *Information Structure*. Oxford: Oxford University Press.
Evans, Gareth. 1980. Pronouns. *Linguistic Inquiry* 11(2): 337-362.
Exteberria, Urtzi. 2008. Contextually restricted quantification in Basque. In A. Giannakidou and M. Rathert, eds., *Quantification, Definiteness, and Nominalization*, pages 76-107. Oxford: Oxford University Press.
Féry, Caroline. 1993. *German Intonation Patterns*. No. 285 in Linguistische Arbeiten. Tubingen: Max Niemeyer Verlag.
Féry, Caroline and Shinichiro Ishihara. 2009. How focus and givenness shape prosody. In M. Zimmermann and C. Féry, eds., *Information structure*, pages 36-63. Oxford: Oxford University Press.
von Fintel, Kai. 1994. *Restrictions on Quantifier Domains*. Doctoral dissertation, University of Massachusetts, Amherst.
Fitzpatrick, Justin. 2006. *The Syntactic and Semantic Roots on Floating Quantification*, Doctoral dissertation, MIT.
Fodor, Janet Dean. 1995 Comprehending sentence structure. In D. N. Osherson, L. R. Gleitman and M. Liberman, eds., *An Invitation to Cognitive Science – Language,* Volume 1, pp.209-246. Cambridge, MA: MIT Press.
Fodor, Janet D. 2002. Prosodic disambiguation in silent reading. In M. Hirotani, ed., *Proceedings of NELS 32*, pages 113-132. Amherst, Mass: GLSA Publications.
Fox Tree, Jean E. and Paul J. A. Meijer. 2000. Untrained speakers' use of prosody in syntactic disambiguation and listeners' interpretations. *Psychological Research* 63(1): 1-13,
Frazier, Lyn. 1987. Syntactic processing: Evidence from Dutch. *Natural Language and Linguistic Theory* 5(4): 519-559.
Fretheim, Thorstein. 2001. The interaction of right-dislocated pronominals and intonational phrasings in Norwegian. In W. Dommelen and T. Fretheim, eds., *Nordic Prosody: Proceedings of the 8th Conference*, pages 61-71. Frankfurt: Peter Lang.
Fodor, Janet D. and Sag, Ivan A. 1982. Referential and quantificational indefinites. *Linguistics and Philosophy* 5: 355-98.
Fujita, Naoya. 1994. *On the Nature of Modification: A Study of Floating Quantifiers and Related Constructions.* Doctoral dissertation, University of Rochester.
Fukushima, Kazuhiko. 1991. *Generalized Floating Quantifiers*. Doctoral dissertation, University of Arizona.
Fukushima, Kazuhiko. 1993. Model theoretic semantics for Japanese floating quantifiers and their scope properties. *Journal of East Asian Linguistics* 2:

213-228.
Fukushima, Kazuhiko. 2007. Conspiracy of form and context for proper semantic interpretation: The implications of lonesome numeral classifiers in Japanese. *Journal of Pragmatics* 39: 960-989.
Giannakidou, Anastasia. 2004. Domain restriction and the arguments of quantificational determiners. Paper presented at SALT 14.
Giannakidou, Anastasia and Lisa Lai-Shen Cheng. 2006. (In)definiteness polarity, and the role of wh-morphology in free choice. *Journal of Semantics* 23: 135-183.
Givón, Talmy. 1988. The pragmatics of word-order: Predictability, importance and attention. In M. Hammond, E. Moravcsik and J. Wirth, eds., *Studies in Syntactic Typology*, pages 243-284. Amsterdam: Benjamin's.
Göbbel, Edward. 2004. Focus and marked positions for VP adverbs. Ms., University of Tübingen.
Grice, Paul H. 1975. Logic and conversation. In P. Cole and J. L. Morgan, eds., *Syntax and Semantics, Volume 3: Speech Acts,* pages 41-58. New York: Academic Press. (Reprinted in Grice, Paul H. 1989. *Studies in the Way of Words*, pages 22-40. Cambridge, MA: Harvard University Press.)
Grimshaw, Jane and Armin Mester. 1988. Light verbs and θ-marking. *Linguistic Inquiry* 19: 205-232
Gundel, Janette K. 1999. On different kinds of focus. In P. Bosch and R. von der Sandt, eds., *Focus: Linguistic, Cognitive, and Computational Perspectives*, pages 293-239. Amsterdam: John Benjamin's.
Gundel, Jeanette K. and Thorstein Fretheim. 2004. Topic and focus. In L. Horn and G. Ward, eds., *The Handbook of Pragmatics*, pages 175-196. London: Blackwell.
Gunji Takao and Koichi Hasida. 1998. Measurement and quantification. In T. Gunji and K. Hasida, eds., *Topics in Constraint-Based Grammar of Japanese*, pages 39-79. Dordrecht: Kluwer.
Gussenhoven, Carlos. 1984. *On the Grammar and Semantics of Sentence Accents*. Dordrecht: Foris.
Haig, John H. 1980. Some observations on quantifier floating in Japanese. *Linguistics* 18: 1065-1083.
Halliday, Michael. 1967. Notes on transitivity and theme in English. Part 1 & 2. *Journal of Linguistics* 3, 37-81, 199-244.
Hamano, Shoko. 1997. On Japanese quantifier floating. In A. Kamio, ed., *Directions in Functional Linguistics*, pages 173-197. John Benjamin's.
Han, Jeonghan. 1999. *Grammatical Coding of Information Structure in Korean: A Role & Reference Grammar (RRG) Account*. Doctoral dissertation, State University of New York at Buffalo.
Hatori, Yuriko. 2002. Nihongo no suuryoushi yuuri [Quantifier float in Japanese: Factual observations on its functional properties]. *Kawamura Gakuen Joshi Daigaku Kiyou* [The Bulletin of the Department of English Literature, Kawamura Women's University] Volume 13(1): 13-32.
Hawkins, John A. 2004. *Complexity and Efficiency in Grammars*. Oxford: Oxford University Press.
Hedberg, Nancy. 2008. Approaching clefts: Syntax, semantics, pragmatics. Paper presented at the Workshop on Clefts, Zentrum für Allgemeine

Sprachwissenschaft (ZAS). Berlin: Germany.
Heim, Irene. 1982. *The Semantics of Definite and Indefinite Noun Phrases*. Doctoral dissertation, University of Massachusetts, Amherst.
Heim, Irene. 1990. E-type pronouns and definite anaphora. *Linguistics and Philosophy* 13(2): 137-178.
Hendriks, Petra. 2003. Optimization in Focus Identification. Ms., University of Groningen.
Hendriks, Petra and Helen de Hoop. 2001. Optimality theoretic semantics. *Linguistics and Philosophy*, 24, 1-32.
Herburger, Elena. 1997. Focus and weak noun phrases. *Natural Language Semantics* 5(1): 53-78.
Herburger, Elena. 2000. *What Counts: Focus and Quantification*. Cambridge, MA: MIT Press.
von Heusinger, Klaus. 1999. Intonation and information structure: The representation of focus in phonology and semantics. Ms. University of Konstanz.
Heycock, Caroline. 1994. *Layers of Predication*. Doctoral dissertation, University of Pennsylvania.
Hirose, Yuki. 2003. Recycling prosodic boundaries. *Journal of Psycholinguistic Research* 32(2): 167-195.
Hirotani, Masako. 2003. Prosodic effects on the interpretation of Japanese Wh-questions. In L. A. Ovalle, ed., *University of Massachusetts Occasional Papers in Linguistics 27: On Semantic Processing*, pages 117-137. University of Massachusetts, Amherst: GLSA.
Hirschberg, Julia, Diane Litman and Marc Swerts. 2004. Prosodic and other cues to speech recognition failures. *Speech Communication* 43 (1)-(2): 155-175.
Hogan, Patrick Colm. (Editor) 2011. *The Cambridge Encyclopedia of the Language Sciences*. Cambridge: Cambridge University Press.
Hoji, Hajime and Yasuo Ishii. 2004. What gets mapped to the tripartite structure of quantification in Japanese. In V. Chand, A. Kelleher, A. J. Rodriguez and B. Schmeiser, eds., *Proceedings of the 23rd West Coast Conference in Formal Linguistics (WCCFL 23)*, pages 101-114. Somerville, MA: Cascadilla Press.
Horvath, Julia. (1995). Structural focus, structural case, and the notion of feature-assignment. In K. É. Kiss, ed., *Discourse Configurational Languages*. pages 28–64. Oxford: Oxford University Press.
Huber, Stefan. 2006. The complex functions of it-clefts. In V. Molnár and S. Winkler, eds., *The Architecture of Focus*, pages 549-578. Berlin/New York: Mouton de Gruyter.
Hwang, Hyekyung and Amy J. Schafer. 2009. Constituent length affects prosody and processing for a dative NP ambiguityin Korean. *Journal of Psycholinguistic Research*, Vol.38 (2): 151-175.
Ikawa, Hisako. 1998. Thetic markers and Japanese/Korean perception verb complements, *Japanese/Korean Linguistics* 7, pages 329-345. Stanford, CA: CSLI Publications.
Inoue, Kazuko. 1978. *Nihongo no Bunpoo Kisoku* [Grammatical Rules in Japanese]. Tokyo: Taishukan.

Ionin, Tania. 2003. *Article Semantics in Second Language Acquisition*. Doctoral dissertation, MIT.
Ishihara, Shin'ichiro. 2000. Scrambling and its interaction with stress and focus. *MIT Working Papers in Linguistics* 38 *[Proceedings of the Twelfth Student Conference in Linguistics (SCIL12)]*, pages 95–110.
Ishihara, Shin'ichiro. 2007. Japanese downstep revisited. *Working Papers of the SFB 632*, University of Potsdam.
Ishihara, Shin'ichiro. 2011. Japanese focus revisited: Freeing focus from prosodic phrasing. *Lingua* 121(13): 1870-1889.
Ishii, Yasuo. 1998. Floating quantifiers in Japanese: NP quantifiers, VP quantifiers, or both? *Researching and Verifying an Advanced Theory of Human Language (2)*, pages 149-171. Chiba: Kanda University of International Studies.
Ishii, Yasuo. 1999. A Note on floating quantifiers in Japanese. In M. Muraki and E. Iwamoto, eds., *Linguistics: In search of the human mind. - A Festschrift for Kazuko Inoue*, pages 236-267. Tokyo: Kaitakusha.
Ishikawa, Kuniyoshi. 2008. Overriding effects of focus on weak NPs in thetic sentences. In A. Nikki, A. Cooper, F. Parrill and T. Wier, eds., *Proceedings of the 40th Annual Meeting of the Chicago Linguistic Society (CLS)*, pages 127-138.
Jackendoff, Ray. 1972. *Semantic Interpretation in Generative Grammar*. Cambridge, MA: MIT Press.
Jackendoff, Ray. 1997. *The Architecture of the Language Faculty*. Cambridge: MIT Press.
Jackendoff, Ray. 2007. *Language, Consciousness, Culture: Essays on Mental Structure*. Cambridge, MA: MIT Press.
Jäger, Gerhard. 1996. *Topics in Dynamic Semantics*. Doctoral dissertation, Humboldt-Universität zu Berlin.
Jun, Sun-Ah. 1993. *The Phonetics and Phonology of Korean Prosody*. Doctoral dissertation, The Ohio State University.
Jun, Sun-Ah and Kim, Sahyang. 2004. Default phrasing and attachment preference in Korean. *Proceedings of the INTERSPEECH-ICSLP* (International Conference on Spoken Language Processing), pages 1-4. Jeju, Korea.
Kadmon, Nirit. 2001. Formal Pragmatics: Semantics, Pragmatics, Presupposition, and Focus. Oxford: Blackwell.
Kadmon, Nirit and Craige Roberts. 1986. Prosody and scope: The role of discourse structure. In A. Farley, P. Farley and K-E. McCullough, eds., *Proceedings of the Chicago Linguistic Society* (*CLS) 22, Part 2: Papers from the Para-session on Pragmatics and Grammatical Theory*, pages 16-28. Chicago Linguistic Society.
Kahnemuyipour, Arsalan. 2009. *The Syntax of Sentential Stress.* Oxford: Oxford University Press.
Kamio, Akio. 1977. Suuryoushi no shintakkusu [The syntax of numeral quantifier]. *Gekkan gengo* 8, pages 83-91. Tokyo: Taishuukan.
Kamio, Akio. 1983. Meishiku no koozoo [Structure of non phrase]. In K. Inoue, ed., *Kooza gendai no gengo (1): Nihongo no kihon koozoo [Modern Japanese vol.1: Basic structure of Japanese]*, pages 77-126. Tokyo: Sanseido.

Kang, Beom-Mo. 2002. Categories and meanings of Korean floating quantifiers – with some reference to Japanese. *Journal of East Asian Linguistics* 11: 375-398.
Kang, Soyoung and Shari Speer. 2005. Effects of prosodic boundaries on syntactic disambiguation. *Studia Linguistica* 59(2-3): 244-258.
Katagiri, Masumi. 1991. Review article of Miyagawa (1989). *Studies in Language* 15: 399-414.
Keenan, Edward L. 1987. A semantic definition of "indefinite NP". In E. Reuland and A. ter Meulen, eds., *The Representation of (In)definiteness*, pages 286-319. Cambridge, MA: MIT Press.
Keenan, Edward L. 2002. Some properties of natural language quantifiers. *Linguistics and Philosophy* 25: 627–654.
Keller, Frank. 2000. *Gradience in Grammar: Experimental and Computational Aspects of Degrees of Grammaticality.* Doctoral dissertation, University of Edinburgh.
Kempson, Ruth, Wilfred Meyer-Viol and Gabbay Dov M. 2001. *Dynamic Syntax: The Flow of Language Understanding*. Oxford: Blackwell.
Kempson, Ruth and Jieun Kiaer. 2004. Japanese scrambling as growth of semantic representation. Ms., King's College, London.
Kempson, Ruth, Ronnie Cann, Jieun Kiaer. 2006. Topic, focus and the structural dynamics of language. In V. Molnár and S. Winkler, eds., *The Architecture of Focus*, pages 59-82. Berlin/New York: Mouton de Gruyter.
Kiaer, Jieun. 2005. Incremental parsing in Korean: At the syntax-phonology interface. Ms., King's College London.
Kim, Alan Hyun-Oak.1995. Word order at the noun phrase level in Japanese: Quantifier constructions and discourse functions. In P. Downing, ed., *Word Order in Discourse*, pages 199-246. Amsterdam/Philadelphia: John Benjamin's.
King, Jeffrey C. 2001. *Complex Demonstratives: A Quantificational Account*. Cambridge, MA: MIT Press.
Kiss, Katalin É. 1995a. *Discourse configurational languages.* Oxford: Oxford University Press.
Kiss, Katalin É. 1995b. NP movement, operator movement and scrambling in Hungarian. In K. É. Kiss, ed., *Discourse Configurational Languages*, pages 207–243. Oxford: Oxford University Press.
Kiss, Katalin É.1998. Identificational focus and information focus. *Language* 74: 245-273.
Kitagawa, Yoshihisa and Shigeyuki Kuroda. 1992. Passives in Japanese. Ms., University of Rochester and University of California, San Diego.
Kitagawa, Yoshihisa and Janet Fodor D. 2006. Prosodic influence on syntactic judgments. In G. Fanslow, C. Féry, R. Vogel and M. Schlesewsky, eds., *Gradience in Grammar*, pages 336-358. Oxford: Oxford University Press.
Ko, Heejeong. 2007. Asymmetries in scrambling and cyclic linearization. *Linguistic Inquiry* 38(1): 49-83.
Ko, Heejeong and Eunjeong Oh. 2010. A hybrid approach to floating quantifiers: experimental evidence. In S. Y. Cheon, ed., *Japanese/Korean Linguistics 19*. Stanford, CA: CSLI Publications.
Kobayashi, Masahiro and Kei Yoshimoto. 2003. Association of floating

quantifiers with NPs: A linear order perspective. Ms., Tohoku University.
Kobuchi-Philip, Mana. 2003. *Distributivity and the Japanese floating quantifier*. Doctoral dissertation, The City University of New York.
Kobuchi-Philip, Mana. 2007. Floating numerals and floating quantifiers. *Lingua* 117(5): 814-831,
König, Ekkehard. 1991. *The Meaning of Focus Particles: A Comparative Perspective*. London/New York: Routledge.
Kori, Shiro. 1997. Nihongo no intoneeshon: kata to kinoo [Japanese intonation: Form and function]. In T. Kunihiro, ed., *Akusento, intoneeshon, rizumu to poozu [Accent, intonation, rhythm, and pause], Vol. 2 of Nihongo Onsei*, pages 169–202. Tokyo: Sanseido.
Kratzer, Angelika. 1995. Stage-level predicates and individual-level predicates. In G. Carlson and F. Pelletier, eds., *The generic book*, pages 125-175. Chicago: University of Chicago Press.
Kratzer, Angelika. 2005. Indefinites and the operators they depend on. G. N. Carlson and F. J. Pelletier, eds., *Reference and Quantification: The Partee Effect*, pages 113-142. Stanford, CA: CSLI Publications.
Krifka, Manfred. 1989. Nominal reference, temporal constitution and quantification in event semantics. In R. Bartsch, J. van Benthem and P. van E. Boas, eds., *Semantics and Contextual Expression*, pages 75-115. Foris, Dordrecht.
Krifka, Manfred. 2006. Focus as identification. In V. Molnar and S. Winkler, eds., *The Architecture of Focus*, pages 105-136. Berlin, New York: Mouton de Gruyter.
Kubozono, Haruo. 1989. Syntactic and rhythmic effects on downstep in Japanese. *Phonology* 6: 39-67.
Kubozono, Haruo. 1993. *The Organization of Japanese Prosody.* Tokyo: Kuroshio Publishers.
Kubozono, Haruo. 2007. Focus and intonation in Japanese: Does focus trigger pitch reset? In S. Ishihara, M. Schmitz and A. Schwarz, eds., *Potsdam Working Papers: Interdisciplinary Studies on Information Structure*, pages 1-27. University of Potsdam, Germany.
Kuhn, Jonas. 2001. Resource sensitivity in the syntax-semantics interface and the German split NP construction. In D. Meurers and T. Kiss, eds., *Constraint-Based Approaches to Germanic Syntax*, pages 177-215. Stanford, CA: CSLI Publications.
Kuno, Susumu. 1973. *The Structure of the Japanese Language*. Cambridge, MA: MIT Press.
Kuno, Susumu. 1976. Subject, theme and the speaker's empathy – a reexamination of relativization phenomena. In C.N. Li, ed., *Subject and Topic*, pages 417-444. New York: Academic Press.
Kuno, Susumu. 1978. *Danwa no bunpoo* [Grammar of discourse]. Tokyo: Taishuukan.
Kuno, Susumu. 1980. Functional syntax. In E. A. Moravsik and J. R. Wirth, eds., *Current Approaches to Syntax*, pages 117-135. New York: Academic Press.
Kuno, Susumu, 1991. Remarks on quantifier scope. In H. Nakajima, ed., *Current English Linguistics in Japan*, pages 261-287. Berlin: Mouton de

Gruyter.
Kuno, Susumu, Ken'ichi Takami and Yuru Wu. 1999. Quantifier scope in English, Chinese, and Japanese. *Language* 75: 63-111.
Kuno, Susumu and Ken'ichi Takami. 2001. *Nichieigo no jidooshi koobun* [A Functional Analysis of Intransitive Constructions in English and Japanese]. Tokyo: Kenkyusha.
Kuroda, Shigeyuki. 1972. The categorical and the thetic judgment: Evidence from Japanese syntax. *Foundations of Language* 9: 153-185.
Kuroda, Shigeyuki. 1980. Bun koozoo no hikaku [The comparison of sentence structures]. In T. Kunihiro, ed., *Nichi-eigo hikaku kooza 2: Bunpoo* [Lectures on Japanese-English comparative studies 2: Grammar], pages 23-61. Tokyo: Taishukan.
Kuroda, Shigeyuki. 2008. Head internal relative clauses, quantifier float, the definiteness effect and the mathematics of determiners. *San Diego Linguistics Papers* 3, pages 126-183. Department of Linguistics, University of California, San Diego.
De Kuthy, Kordula. 2009. Basic notions of information structure. Ms., University of Tübingen.
Ladd, Robert, D. 1980. *The Structure of Intonational Meaning*, Indiana University Press, Bloomington and London.
Ladd, Robert, D. 1996. *Intonational Phonology*. Cambridge: Cambridge University Press.
Lambrecht, Knud. 1994. *Information Structure and Sentence Form: A Theory of Topic, Focus and the Mental Representations of Discourse Referents*. Cambridge: Cambridge University Press.
Landman, Fred. 1989a. Groups I. *Linguistics and Philosophy* 12: 559-605.
Landman, Fred. 1989b. Groups II. *Linguistics and Philosophy* 12: 723-744.
Landman, Fred. 1996. Plurality. In S. Lappin, ed., *The Handbook of Contemporary Semantic Theory*. Oxford: Blackwell.
Landman, Fred. 2000. *Events and Plurality: The Jerusalem lectures*. Dordrecht: Kluwer.
Larson, Richard. 2003. Sentence-final adverbs and scope. *Proceedings of NELS 34*, pages 23-43.
Larson, Richard and Franc Marušič. 2004. On indefinite pronoun structures with APs: Reply to Kishimoto. *Linguistic Inquiry* 35(2): 268-287.
Larson, Richard and Naoko Takahashi. 2006. Order & Interpretation in Prenominal Relative Clauses. Ms., State University of New York at Buffalo.
Leech, Geoffrey. 1981. *Semantics (2nd edition)*. Harmondsworth: Penguin.
Lewis, David. 1970. General semantics. *Synthèse* 22: 18-67.
Lieberman, Philip. 1975. *On the Origins of Language*. New York: MacMillan.
Link, Godehard. 1983. The logical analysis of plurals and mass terms: a lattice-theoretical approach. In R. Bäuerle, C. Scwarze and A. von Stechow, eds., pages 303-323.
Link, Godehard. 1984. Hydras: On the logic of relative constructions with multiple heads. In F. Landman and F. Veltman, eds., *Varieties of Formal Semantics. Proceedings of the Fourth Amsterdam Colloquium*, pages 245-257. Foris: Dordrecht.
López, Luis. 2009. *A Derivational Syntax for Information Structure.* Oxford:

Oxford University Press.
Machida, Ken. 2000. On some factors which determines the well-formedness of quantifier floating. In *Nagoya daigaku bungakubu kiyoo* [The *Bulletin of the Department of Literature, Nagoya University*] 46: 55-70.
Maekawa, Kikuo. 1991. Perception of intonational characteristics of wh and non-wh questions in Tokyo Japanese. In *Proceedings of the International Congress of Phonetic Sciences (ICPhS) Volume 4*, pages 202–205. Aix-en-Provence: Université de Provence.
Martin, Samuel. 1975. *A Reference Grammar of Japanese*. New Haven/London: Yale University Press.
Mathesius, Vilém. 1929. Zur Satzperspektive im modernen Englisch. *Archiv für das Studium der modernen Sprachen und Literaturen 155*, pages 200-210.
Matsumoto, Yo. 1993. Japanese numeral classifiers: A study on semantic categories and lexical organization. *Linguistics* 31: 667-713.
McCawley, James D. 1965. *The Accentual System of Standard Japanese*. Doctoral dissertation, MIT.
McClure, William. 2000. *Using Japanese – A Guide to Contemporary Usage.* Cambridge: Cambridge University Press.
de Mey, Sjaak. 1991. "Only" as a determiner and as a generalized quantifier. *Journal of Semantics* 8: 91-106.
Mihara, Ken'ichi. 1998. Suuryoushi renketsu koobun-to 'kekka'-no gan'i [Quantifier linking construction and the implication of 'resultative']. *Gengo* [Language] 6-8: 86-95/94-102/104-113.
Milsark, Gary. 1974. *Existential Sentences in English*. Doctoral dissertation, MIT.
Misono, Yasuko, Reiko Mazuka, Tadahisa Kondo and Shigeru Kiritani. 1997. Effects and limitations of prosodic and semantic biases on syntactic disambiguation. *Journal of Psycholinguistic Research* 26(2): 229-245,
Mithun, Marianne. 2006. Threads in the tapestry of syntax: complementation and Mohawk. In R. Peachery et al., eds., *Proceedings of the 52nd Meeting of the Chicago Linguistic Society*, pages 213-237. Chicago Linguistic Society.
Miyagawa, Shigeru. 1989. *Structure and case-marking in Japanese*. New York: Academic Press.
Miyagawa, Shigeru and Koji Arikawa. 2007. Locality in syntax and floating numeral quantifiers. *Linguistic Inquiry* 38(4): 645-670.
Mizuguchi, Shinobu. 2004. *Individuation in Numeral Classifier Languages*. Tokyo: Syoohakusya.
Molnár, Valéria. 1991. *Das TOPIK im Deutschen und im Ungarischen.* Stockholm: Aimquist & Wiksell International, Lunder Germanische Forschungen 58.
Molnár, Valéria. 1993. Zur Pragmatik und Grammtik des TOPIK-Begrifes, In Malga Reis, ed., *Wortstellung und Informationstructur, Linguistiche Arbeiten 306*, pages 155-202. Tubingen: Niemeyer,.
Montague, Richard. 1973. The proper treatment of quantification in ordinary English. In T. Richmond, ed., *Formal philosophy: selected papers of Richard Montague*, pages 247-270. New Haven, CT: Yale University Press.
Mori, Yoshiki and Kei Yoshimoto. 2002. If a quantifier is not floated, but moored or been incorporated: complexity of presuppositions in local domain.

In *Proceedigs for Pacific Asia Conference on Language, Information, and Computation 16*, pages 330-347.
Morrill, Glyn. 1994. *Type-Logical Grammar*. Dordrecht: Kluwer.
Nagahara, Hiroyuki. 2004. *Phonological Phrasing in Japanese.* Doctoral dissertation, University of California, Los Angeles.
Naito, Seiji. 1995. Quantifier floating. In K. Takami, ed., *Niti-eigo no uhoo-idoo-koobun* [Right dislocation construction in Japanese and English], pages 199-225. Tokyo: Hituzi Syobo.
Nakanishi, Kimiko. 2004. *Domains of Measurement: Formal Properties of Non-split/Split Quantifier Constructions*. Doctoral dissertation, University of Pennsylvania.
Nakanishi, Kimiko. 2007. *Formal Properties of Measurement Constructions*. Berlin/New York: Mouton de Gruyter.
Nakanishi, Kimiko. 2008. The syntax and semantics of floating numeral quantifiers. In S. Miyagawa and M. Saito, eds., *The Oxford Handbook of Japanese Linguistics*, pages 287-319. Oxford: Oxford University Press.
Nesper, Marina and Irene Vogel B. 1986. *Prosodic Phonology*. Dordrecht: Foris.
Ohki, Mitsuru. 1987. Nihongo no yuuri suuryoushi no danwa kinoo ni tsuite [On discourse functions of floating quantifiers in Japanese]. *Sichookaku Gaikokugo-kyooiku kenkyuu* [Research in Audio-Visual Education of Foreign Languages] 10: 37-68.
Oshima, David Y. 2007. Boundary tones or prominent particles? Variation in Japanese focus marking contours. In *Berkeley Linguistics Society (BLS) 31*, pages 453–464.
Partee, Barbara H. 1973. Some transformational extensions of Montague grammar. *Journal of Philosophical Logic* 2(4): 509-534.
Partee, Barbara H. 1986. Noun phrase interpretation and type-shifting principles. In J. Groenendijk, D. de Jongth, and M, Stokhof, eds., *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*, pages 115-143. Dordrecht: Foris.
Partee, Barbara, H. 1991. Topic, focus and quantification. In S. Moore and A. Wyner, eds., *Proceedings of Semantics and Linguistic Theory 1*, pages 159-187. Cornel University, Ithaca, NY.
Partee, Barbara, H. 1992. Syntactic categories and semantic type. In M. Rosner and R. Johnson, eds., *Computational Linguistics and Formal Semantics*, pages 97-126. Cambridge: Cambridge University Press.
Partee, Barbara, H. 1995. Quantificational structure and compositionality. In E. Bach, E. Jelinek, A. Kratzer and B. Partee, eds., pages. 541-602.
Partee, Barbara, H. and Mats Rooth. 1983. Generalized conjunction and type ambiguity. In R. Bäuerle, C. Schwarze and A. von Stechow, eds., pages 361-383.
Partee, Barbara, Alice ter Meulen and Robert Wall. 1990. Mathematical Methods in Linguistics (Studies in Linguistics and Philosophy, 30), Corrected second printing of the first edition. Dordrecht: Kluwer.
Peterson, Philip L. 1997. *Fact Proposition Event*. Dordrecht: Kluwer.
Peters, Stanley and Dag Westerståhl. 2006. *Quantifiers in Language and Logic*. Oxford: Clarendon Press.

Pierrehumbert, Janet. 1980. *The Phonology and Phonetics of English Intonation*. Doctoral dissertation, MIT. (Distributed by Indiana University Linguistics Club, Bloomington.)
Pierrehumbert, Janet and Mary Beckman E. 1988. *Japanese Tone Structure.* Cambridge, MA: MIT Press.
Pierrehumbert, Janet and Julia Hirschberg. 1990. The meaning of intonational contours in the interpretation of discourse. In P. R, Cohen, J. Morgan and M. E. Pollack, eds., *Intentions in Communication*, pages 271-311. Cambridge, MA: MIT Press.
Pinker, Steven. 2007. *The Stuff of Thought - Language as a Window into Human Naure.* Penguin Books.
Portner, Paul and Katsuhiko Yabushita. 2001. Specific indefinites and the information structure theory of topics. *Journal of Semantics* 18(3): 271-297.
Poser, William J. 1984. *The Phonetics and Phonology of Tone and Intonation in Japanese.* Doctoral dissertation, MIT.
Potts, Christopher. 2003. *The Logic of Conventional Implicature*. Doctoral dissertation, University of California, Santa Cruz.
Prevost, Scott A. 1995. *A Semantics of Contrast and Information Structure for Specifying Intonation in Spoken Language Generation*. Doctoral dissertation, University of Pennsylvania.
Price, Patti J., Mari Ostendorf, Stefanie Shattuck-Hufnagel, Cynthia Fong. 1991. The use of prosody in syntactic disambiguation. *Journal of the Acoustical Society of America* 9: 2956-2970.
Prince, Ellen F. 1986. On the syntactic marking of presupposed open propositions. In A. Farley, P. Farley and K. E. McCullough, eds., *Papers from the Para-session on Pragmatics and Grammatical Theory, 22nd Regional Meeting, Chicago Linguistic Society*, pages 208-222. Chicago IL: Chicago Linguistic Society.
Prince, Ellen F. 1992. The ZPG letter: Subjects, definiteness, and information status. In W. C. Mann and S. A. Thompson, eds., *Discourse Description: Diverse Linguistic Analyses of a Fund-raising Text*, pages 295-326. Philadelphia, PA: John Benjamin's.
Reed, Ann M. 2010. The discourse function of floated quantifiers. *Journal of Pragmatics* 42(6): 1737-1761.
Rizzi, Luigi. 1997. The fine structure of left periphery. In L. Haegeman, ed., *Elements of Grammar*. Dordrecht: Kluwer, pages 281-337.
Roberts, Craige. 1996. Information structure in discourse: towards an integrated formal theory of pragmatics. In J. H. Yoon and A. Kathol, eds., *Ohio State University Working Papers in Linguistics 49*, pages 1-54.
Roberts, Craige. 2003. Uniqueness in definite noun phrases. *Linguistics and Philosophy* 26: 287-350.
Roberts, Craige. 2004. Pronouns as definite. In M. Reimer and A. Bezuidenhout, eds., *Descriptions and Beyond*, pages 503-543. Oxford: Clarendon Press.
Rochman, Lisa. 2005. The role of intonation in floating quantifiers. In *Proceedings of ConSOLE XIII*, pages 313-330.
Rochman, Lisa. 2010. Why float? Floating quantifiers and focus marking. In N. Erteschik-Shir and L. Rochman, eds., *The Sound Patterns of Syntax*, pages

72-92. Oxford: Oxford University Press.
Rooth, Mats. 1985. *Association with Focus*. Doctoral dissertation, University of Massachusetts, Amherst.
Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* 1: 75-116.
Rooth, Mats. 2005. Topic accents on quantifiers. In G. N. Carlson and F. J. Pelletier, eds., *Reference and Quantification: The Partee Effect*, pages 303-328. Stanford, CA: CSLI Publications.
Schafer, Amy J., Katy Carlson, Harles Clifton and Lyn Frazier. 2000a. Focus and the interpretation of pitch accent: disambiguating embedded questions. *Language and Speech* 43: 75-105
Schafer, Amy J., Shari Speer R., Paul Warren and David White S. 2000b. Intonational disambiguation in sentence production and comprehension. *Journal of Psycholinguistic Research* 29(2): 169-182.
Schafer, Amy J. and Sun-Ah Jun. 2001. Effects of accentual phrasing on adjectiveinterpretation in Korean, In M. Nakayama, ed., *Sentence Processing in East Asian Languages*, pages 223-255. Stanford, CA: CSLI Publications.
Schwarzschild, Roger. 1992. Types and plural individuals. *Linguistics and Philosophy* 15: 641-675.
Schwarzschild, Roger. 1996. *Pluralities*. Dordrecht: Kluwer.
Schwarzschild, Roger. 1999. Givenness, avoid-F and other constraints on the placement of accent. *Natural Language Semantics* 7: 141-177.
Schwarzschild, Roger. 2002. Singleton indefinites. *Journal of Semantics* 19: 289-314.
Selkirk, Elisabeth. 1978. On prosodic structure and its relation to syntactic structure. In T. Fretheim, ed., *Nordic Prosody II*, pages 268–271. Trondheim: TAPIR.
Selkirk, Elisabeth. 1984. *Phonology and Syntax: the Relation between Sound and Structure*. Cambridge, MA: MIT Press.
Selkirk, Elisabeth. 1986. Derived domains in sentence phonology. *Phonology* 3: 371-405.
Selkirk, Elisabeth. 1990. On the nature of prosodic constituency. *Papers in Laboratory Phonology* 1: 179-200.
Selkirk, Elisabeth. 1995. Sentence prosody: intonation, stress and phrasing. In J. A. Goldsmith, ed., *The Handbook of Phonological Theory*, pages 550-569. Oxford: Blackwell.
Selkirk, Elisabeth and Koichi Tateishi. 1991. Syntax and downstep in Japanese. In C. Georgopoulos and R. Ishihara, eds., *Interdisciplinary approaches to language: Essays in honor of S.-Y. Kuroda*, pages 519-543. Dordrecht: Kluwer Academic Publishers.
Selkirk, Elisabeth. 2000. The interaction of constraints on prosodic phrasing. In M. Horne, ed., *Prosody: Theory and Experiment*, pages 231-262. Amsterdam: Kluwer.
Shan, Chung-Chieh and Chris Barker. 2006. Explaining crossover and superiority as left-to-right evaluation. *Linguistic and Philosophy* 29: 91-134.
Shibatani, Masayoshi. 1978. *Nihongo no bunseki* [Analysis of Japanese]. Tokyo: Taishukan.

Shimojima, Atsushi, Yasuhiro Katagiri, Hanae Koiso and Marc Swerts. 2002. Informational and dialogue-coordinating functions of prosodic features of Japanese echoic responses. *Speech Communication* 36 (1-2): 113-132.
Shimojo. Mitsuaki. 2004. Quantifier float and information processing: a case study from Japanese. Journal of Pragmatics 36(3): 375-405.
Shiobara, Kayono. 2004. *Linearization: A Derivational Approach to the Syntax-Prosody Interface.* Doctoral dissertation, UBC.
Soams, Scott. 1986. Incomplete definite descriptions. *Notre Dame Journal of Formal Logic* 27(3): 349-375.
Sorace, Antonella and Frank Keller. 2004. Gradience in linguistic data. *Lingua* 115: 1497-1524.
Sperber, Dan and Wilson, Deirdre. 1986. *Relevance: Communication and Cognition*. Cambridge, MA: Harvard University Press. (Second edition, 1995, Oxford: Blackwell.)
Stechow, Arnim von and Susanne Uhmann. 1986. Some remarks on focus projection. In W. Abraham and S. de Meij, eds., *Topic, Focus and Configurationality.* Amsterdam: John Benjamin's.
Stechow, Arnim von. 1991. Focusing and background operators. In A. Werner, ed., *Discourse Particles: Descriptive and Theoretical Investigations on the Logical, Syntactic and Pragmatic Properties of Discourse Particles in German*, pages 37-84. Amsterdam: John Benjamin's.
Steedman, Mark. 1991. Structure and intonation. *Language*, 67, 260–296.
Steedman, Mark. 1996. *Surface structure and interpretation*. Cambridge, Mass: MIT Press.
Steedman, Mark. 2000a. Information structure and the syntax-phonology interface. *Linguistic Inquiry* 34: 649–689.
Steedman, Mark. 2000b. *The Syntactic Process*. Cambridge, MA: MIT Press.
Steedman, Mark. 2007. On "the computation". In G. Ramchand and C. Reiss, eds., *The Oxford Handbook of Linguistic Interfaces*, 575-611. Oxford: Oxford University Press.
Steedman, Mark and Jason Baldridge. 2011. Combinatory categorial grammar. In R. Boyer and K. Borjars, eds., *Non-Transformational Syntax: A Guide to Current Models*, 181-224. Oxford: Blackwell.
Steedman, Mark. 2012. *Taking Scope: The Natural Semantics of Quantifiers*. Cambridge, MA: MIT Press.
Stirling, Lesley. 1985. Distributives, quantifiers and a multiplicity of events. In *Proceedings of the 2nd Conference of the European Chapter of the Association of Computational Linguistics (ACL)*, pages 16-24.
Sugahara, Mariko. 2003. *Downtrends and Post-Focus Intonation in Japanese*. Doctoral dissertation, University of Massachusetts, Amherst.
de Swart, Henriëtte. 1996. (In)definite and genericity. In M. Kanazawa et al., eds., *Quantifiers*, *Deduction and Context*, pages 171-94. Stanford, CA: CSLI Publications.
Takami, Ken'ichi. 1998 Nihongo no suuryoushi yuuri ni tsuite: kinouronteki bunseki [On quantifier floating in Japanese: A functional analysis]. *Gekkan gengo* [Language] 27(1): 86-95, 27(2):86-95, 27(3):98-107. Tokyo: Taishuukan.
Takano, Hisako. 1992. *Syntactic and Semantic Natures of Japanese Common*

Nouns. Doctoral dissertation, Michigan State University.
Tanaka, Seiko. 2006. *An Analysis of Non-Standard Judgment Cases of Floating Numeral Quantifiers in Japanese*. Master's thesis, University of Tokyo.
Tancredi, Christopher. 2005. Plural predicates and quantifiers. In N. Imanishi, ed., *Gengo kenkyuu no uchuu* [The World of linguistic research: A Festschrift for Kinsuke Hasegawa on the occasion of his seventieth birthday], pages 14-28. Tokyo: Kaitakusya.
Tanenhaus, Michael K. and John C. Trueswell. 1995. Sentence comprehension. In J. Miller and P. Eimas, eds., *Handbook of Perception and Cognition, Volume 11*. London: Academic Press.
Tanenhaus, Michael K. and John C Trueswell. 2007. Eye movements and spoken language comprehension. In M. Traxler and M.A. Gernsbacher, eds., *Handbook of Psycholinguistics*, Second Edition. Amsterdam: Elsevier.
Tsimpli, Maria I. (1995). Focusing in Modern Greek. In K. É. Kiss, ed., *Discourse Configurational Languages*, pages 176–206. Oxford: Oxford University Press.
Truckenbrodt, Hubert. 1995. *Phonological Phrases: Their Relatin to Syntax, Focus, and Prominence.* Doctoral dissertation, MIT.
Truckenbrodt, Hubert. 1999. On the relation between syntactic phrases and phonological phrases. *Linguistic Inquiry* 30(2): 219-255.
Truckenbrodt, Hubert. 2007.The syntax-phonology interface. In P. de Lacy, ed., *The Cambridge Handbook of Phonology*, pages 435-456. Cambridge: Cambridge University Press.
Vallduví, Enric. 1992. *The Informational Component*. New York/London: Garland.
Vallduví, Enric. 1995. Structural properties of information packaging in Catalan. In K. É. Kiss, ed., *Discourse Configurational Languages*, pages 122–152. Oxford: Oxford University Press.
Vallduví, Enric and Maria Vilkuna. 1998. On rheme and contrast. In P. Cullicover and L. McNally, eds., *Syntax and Semantics 29 – The Limits of Syntax*, pages 79-108. New York: Academic Press.
Vallduví, Enric and Elisabeth Engdahl. 1996. The linguistic realization of information packaging. *Linguistics* 34(3): 459-519.
Van Valin, Robert D., Jr. 2005. *Exploring the Syntax-Semantics Interface*. Cambridge: Cambridge University Press.
Van Valin, Robert D., Jr. and LaPolla, Randy. 1997. *Syntax.* Cambridge University Press.
Venditti, Jennifer J. 2006. Prosody in sentence processing. In R. Mazuka, M. Nakayama and Y. Shirai, eds., *The Handbook of East Asian Psycholinguistics, Volume II: Japanese*, pages 208-217, Cambridge: Cambridge University Press.
Venditti, Jennifer J., Kikuo Maekawa, and Mary E. Beckman. 2008. Prominence marking in the Japanese intonation system. In S. Miyagawa and M. Saito, eds., *Handbook of Japanese Linguistics*, pages 458-514. Oxford: Oxford University Press.
Vilkuna, Maria. (1995). Discourse configurationality in Finnish. In K. É. Kiss, ed., *Discourse Configurational Languages*, pages. 244–268. Oxford: Oxford University Press.

Wasow, Thmas. 2002. *Postverbal Behaviors*. Stanford, CA: CSLI Publications.
Watanabe, Akira. 2006. Functional projections of nominals in Japanese: Syntax of classifiers. *Natural Language and Linguistic Theory* 24: 241-306.
Watanabe, Akira. 2008. The structure of DP. In S. Miyagawa and M. Saito, eds., *The Oxford Handbook of Japanese Linguistics*, 513-540. Oxford: Oxford University Press.
Watson, Duane and Edward Gibson. 2005. Intonational phrasing and constituency in language production and comprehension. *Studia Linguistica* 59(2-3): 279–300.
Williams, Edwin. 1997. Blocking and anaphora. *Linguistic Inquiry* 28: 577-628.
Wood, Mary McGee. 1993. *Categorial Grammars*. London and New York: Routledge.
Yamamori, Yoshie. 1999. Floating quantifiers and topic-focus structure in Japanese. In *Proceedings of the Second International Conference on Cognitive Science*, pages 1022-1025.
Yamamori, Yoshie. 2006. *Nihongo no genryoo hyoogen no kenkyuu* [A Study of quantifier expressions in Japanese]. Tokyo: Kazama syoboo.
Yatabe, Shûichi. 1990. Quantifier floating in Japanese and the θ-hierarchy. In *Proceedings of 26th Chicago Linguistics Society,* pages 437-451.
Yatabe, Shûichi. 1993. *Scrambling and Japanese phrase structure*. Doctoral dissertation, Stanford University.
Yokota, Kenji. 1999. Light verb constructions in Japanese and functional uncertainty. In M. Butt and T. H. King, eds., *Proceedings of the LFG99 Conference*. Stanford: CSLI Publications. [Available at http://www.csli. stanford.edu/publications/LFG/lfg4.html.]
Yokota, Kenji. 2005. The structure and meaning of Japanese light verbs. *Language Sciences* 27(3): 247-280. Elsevier.
Yokota, Kenji. 2009. On floating numeral quantifiers in Japanese. In H. Hiroto, ed., *The Dynamics of the Language Faculty: Perspectives from Linguistics and Cognitive Neuroscience*, pages 85-109. Kuroshio Publishers.
Yokota, Kenji. 2010. Prosody and quantifier float. In *Proceedings of 8th Conference on Semantics and Formal Modelling (Actes des 8èmes Journées Sémantique et Modélisation (JSM'10)*, pages 49-51. Nancy, France: LORIA-INRIA Nancy Grand Est.
Yokota, Kenji. 2011. The dual analysis of manner adverbs in Japanese. *Language Sciences* 33(3): 386-400. Elsevier.
Zubizaretta, M. L. 1998. *Prosody, Focus, and Word Order.* Cambridge, MA: MIT Press.