Intonation and Interface Conditions

by

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Submitted to the Department of Linguistics and Philosophy
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy in Linguistics

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

September 2003

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In memory of

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and
Shonosuke Ishihara

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Abstract

The thesis presents a theoretical and experimental investigation of the interaction between *focus intonation pattern (FIP)* and certain syntactic phenomena—especially those involving *wh*-questions—in Japanese. A phonological mechanism of FIP formation is proposed that accounts for the variety of FIPs observed in various syntactic configurations.

In the FIPs of Japanese *wh*-questions, the F_0 of *wh*-phrases is raised, and the F_0 of following phrases is lowered. There is a correlation between the domain of F_0-lowering and the scope of the *wh*-phrase. In a matrix *wh*-question, F_0-lowering after the *wh*-phrase continues until the end of the sentence, while in the case of an indirect *wh*-question, it stops at the end of the embedded clause.

I account for this FIP-*Wh*-scope correspondence as follows. A pair of phonological rules is proposed that manipulate the prominence relations between semantically focalized phrases and post-focus phrases. These rules apply cyclically during the course of syntactic derivations, rather than waiting until the whole sentence is syntactically composed. Adopting the *Multiple Spell-Out* analysis (Chomsky, 2000, 2001b), I propose that the phonological rules for FIP formation apply to Spell-Out domains, rather than to a whole sentence. This proposal departs from previous analyses of FIP in Japanese (Truckenbrodt, 1995; Selkirk, 2003; Sugahara, 2003) in two respects: (1) it does not refer to prosodic phrasing; and (2) it is based on a cyclic model instead of a single-output model.

The analysis makes the following prediction: if there are two *wh*-phrases that take different scopes in a single sentence, two independent FIPs will be created at different Spell-Out domains. This prediction was tested instrumentally. The results show that such a pitch contour is possible, and confirms other predictions as well.

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Acknowledgments

First of all, I would like to thank my parents, Tadaharu and Yoshiko Ishihara, for their love, support, and encouragement throughout my life. They built the foundation of what I am now. My father often took me to various foreign movies, from which I learned that there are so many languages around the world. My mother allowed me to breed various kinds of animals, including disgusting bugs and insects that nobody would like to have in one's house. In retrospect, I think that these experiences were the start of my interest in language and natural science.

I would also like to thank my grandmother, Haruko Ishihara, for her support and encouragement. Whenever I see her, she encourages me to learn as much as I can and to appreciate the opportunity given to me thanks to many people around me. She has been the biggest supporter of my academic life.

My committee members, David Pesetsky (supervisor), Danny Fox, Michael Kenstowicz, and Donca Steriade, were really helpful at various stages of my dissertation writing, and always insightful. David always pointed out many unclear points by asking me sometimes tough but stimulating questions, which all helped me clarify the issues and provided me with directions. He has been supporting me from my first year at MIT, not only for the time I was writing the dissertation. He has always been generous for his time and energy. Danny never loses a big picture in his mind even when I am stuck and lost at some minor detail. His questions and comments are always always to the point, leading me to what my study is related to and where I should head to. Michael, who has been my committee member since I was writing generals papers, has been always generous about reading my drafts and making precise comments. Donca, who I asked to join my committee very late, has been extraordinarily insightful and stimulating from the very first meeting we had. I always had a lot of fun meeting and talking with her. It could have not been possible to finish this dissertation without their enormous help and support. I can never appreciate them too much.

I am also thankful to other faculty members of the department, Noam Chomsky, Irene

Heim, Alec Marantz, and Norvin Richards. I am especially grateful to Shigeru Miyagawa, who has been supportive not only in linguistics, but also in job search and other aspects of life. Special thanks go to Hubert Truckenbrodt, who was a visiting scholar when I was struggling with my phonology generals paper. He helped me develop some ideas, and taught me every step of conducting a phonetic experiment. Considering the topic of my dissertation, it is clear that his influence was really enormous to me.

I always feel very lucky and proud to be among the members of the ling-98 class at MIT linguistics, with María Cristina Cuervo, Elena Guerzoni, Daniel Harbour, Zhiqiang Li, Tatjana Marvin, Ora Matushansky, Olga Vaysman, and Jessie Little doe Fermino. Since the first year, we have been always working together and having fun together. I cannot imagine a life at MIT without them.

I also had a lot of fun time with my Japanese colleagues at the department: Ken Hiraiwa, Shogo Suzuki, and Shoichi Takahashi. I had a number of interesting discussions, which often went over night, with Ken when we were roommates. Shogo was a good "night time" pal, when I was working all night at the department.

While I was working on the dissertation, I asked for help in phonetics, experimental/theoretical phonology, and statistics to various people, to whom I owe much: Kikuo Maekawa, Stefanie Shattuck-Hufnagel, Karen Froud, and Lisa Selkirk. I also benefitted from many insightful comments from other linguists and interesting discussions with them. Especially, I appreciate comments received at TCP 2003 at Keio University, WCCFL XXI at UC Santa Cruz and LP2002 at Meikai University, where I presented my work, which was eventually developed into the dissertation topic. I would like to thank people I met there, including Daiko Takahashi, Masatoshi Koizumi, and Mamoru Saito, with whom I attended a workshop at LP2002. They also helped me during the job search. Also, around the same time as I was working on this topic, some researchers, Masanori Deguchi and Yoshihisa Kitagawa (Deguchi and Kitagawa, 2002; Kitagawa and Fodor, To appear), and Satoshi Tomioka (Lee and Tomioka, 2001; Kitagawa and Tomioka, 2003), were independently looking at the similar phenomena in Japanese. Their work, as well as communication with them, helped

me develop my analysis further. It would be interesting to examine and integrate their work and mine as future research.

I was supported by many friends during the dissertation writing period, which could have been nothing but hectic without them. The fun I had with them during this period kept me from being insane. I refrain from listing their names here because I would not like to miss anyone by an oversight, but I hope they know that their names would be on the list if I made it.

I would also like to thank professors in my former universities: George D. Bedell and Tomoyuki Yoshida of International Christian University, who first brought me into the world of linguistics, and Christopher Tancredi and Yoshio Endo of Yokohama National University[1], from whom I learned the basics of linguistics.

I am grateful to a few of my personal friends from whom I especially received huge support. Kazutoshi Ohno, who is my big "senpai," both as a linguist as well as a baseball player, has been encouraging me throughout the last five years. Ryo Saegusa, who I have known more than 25 years, has been, and will be, the best friend in my life.

Lastly, I would like to thank Rika Kuzumi, who first encouraged me to apply to MIT when I was also considering other careers, for her support for the last five years.

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[1]Professor Tancredi is now in University of Tokyo.

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List of Abbreviations

†   Judgment status for the '*Wh*-island' (See §3.2.1)

ACC   Accusative

C   Complementizer

COP   Copula

DAT   Dative

DECL   Declarative

FIP   Focus Intonation Pattern

GEN   Genitive

IP   Intonation Phrase

LOC   Locative

MaP   Major Phrase

MiP   Minor Phrase

NEG   Negation

NOM   Nominative

PAST   Past

PFR   Post-FOCUS Reduction

PWd   Prosodic Word

Q   Q-particle

RPC   Relative Prominence Constraint

TOP   Topic

Chapter 1

Introduction

This thesis explores the interaction between intonation and certain syntactic phenomena in Japanese. I focus especially on *wh*-questions. The overall summary of the thesis is as follows.

1.1 Overview

In Ch. 2, we first see that FIP is characterized by a combination of F_0-raising (which we will call *P-focalization*) on the semantically focalized phrase and F_0-lowering of the material following the focalized phrase (*Post-FOCUS Reduction, PFR*). We next review previous accounts of focus intonation pattern in Japanese (Truckenbrodt, 1995; Selkirk, 2002, 2003; Sugahara, 2003). In these analyses, F_0-raising/lowering is viewed as alternations in the prosodic phrasing. There are phenomena, however, that indicate that the realization of FIP does not depend on the prosodic phrasing. They include cases where PFR (F_0-lowering) is observed even when the prosodic phrasing is not altered. There are also cases where a P-focalized phrase does not signal the existence of a phrase boundary. This is not expected under the prosodic phrasing account reviewed in this chapter. In this thesis, I will propose an alternative analysis in which FIP is interpreted as manipulation of the relative prominence of the focalized phrase and the phrases following it, rather than as manipulation of prosodic phrasing.

Before presenting the proposal, in Ch. 3, we survey the intonation patterns of various *wh*-constructions in Japanese, which will be extensively discussed in the remainder of the thesis. Japanese *wh*-constructions show FIP: *wh*-phrases are P-focalized, and followed by PFR. Strikingly, PFR after a *wh*-phrase does not always continue until the end of the sentence. Instead, there is a correlation between the domain of PFR and the scope of the *wh*-phrase. For example, in a matrix *wh*-question sentence, PFR after the *wh*-phrase continues until the end of the sentence. In indirect *wh*-questions, on the other hand, PFR stops at the the end of the embedded clause. This FIP-*Wh*-Scope Correspondence will be accounted for under the proposal presented in the next chapter.

In Ch. 4, the main proposal of the thesis is presented. I first propose a pair of phonological rules that derives FIP in Japanese. The rules manipulate the prominence of the semantically focalized phrase and those of post-focus phrases. The proposal is crucially different from previous accounts (which interpret FIP as the result of the manipulation of prosodic phrasing) in that the proposed rules refer to prominence, not to prosodic phrasing. FIP is interpreted as the realization of prominence relations (created by the proposed phonological rules) between focalized phrases and post-focus phrases. The independence of the FIP formation mechanism from prosodic phrasing allows us to explain the FIP-related phenomena discussed in Ch. 2, which are, in fact, independent of phrasing.

I will also claim that these rules apply cyclically during the course of the syntactic derivation, instead of applying after all the sentence are syntactically composed (cf. Bresnan, 1972). By adopting the *Multiple Spell-Out* analysis (Chomsky, 2000, 2001b), I propose that the phonological rules for FIP formation apply to Spell-Out domains, rather than to a whole sentence. This proposal derives the FIP-*Wh*-Scope Correspondence in a straightforward fashion.

The analysis proposed in this chapter, makes the following prediction: if there are two *wh*-phrases that take different scopes, two independent FIPs will be created at different Spell-Out domains. This means that embedding of an FIP into another FIP should be possible. In order to test this prediction, an experiment was conducted. We will discuss the results

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of the experiment in Ch. 5. The results in fact show that FIP embedding is possible. The results also support other predictions made by the proposal.

In Ch. 6, we discuss cases where two FIPs are involved within a single sentence. It has been observed (Saito, 1982, 1987) that when there are two *wh*-phrases in an embedded clause and they take different scopes (e.g., one taking the matrix scope while the other taking the embedded scope), the linearly first *wh*-phrase must take wider scope than the following one. I will claim that this apparently syntactic or semantic restriction on *wh*-scope taking is in fact prosodic in nature, and propose a phonological account. Also, we discuss a case where this restriction disappears. I will claim that the key to solving the problem is *givenness*, which has been reported to have effects on prosody.

Chapter 2

Focus Intonation Pattern (FIP) in Japanese

In this chapter, we will discuss the special intonation pattern that appears when a phrase in a sentence is semantically focalized. We will call this pattern the *Focus Intonation Pattern (FIP)* throughout this thesis.

The main purpose of this chapter is to review some of the earlier literature on FIP, and to show that there are cases that cannot be accounted for under the previous analyses. The proposal of this thesis will be made in Ch. 4.

The organization of this chapter is as follows. Before we discuss the Focus Intonation Pattern, we will briefly survey Japanese intonation phonology in general as a background (McCawley, 1965; Poser, 1984; Pierrehumbert and Beckman, 1988; Selkirk and Tateishi, 1988, 1991; Kubozono, 1993; Nagahara, 1994; Maekawa, 1997a, among others) (§2.1). Then, we will see what an FIP looks like (§2.2). When an FIP is created, there are two prosodic phenomena that require attention: (1) the raising of the F_0 peak on the semantically focalized phrase; and (2) the lowering of F_0 of the material following the semantically focalized phrase.

In §2.3, we will examine what has been claimed in earlier literature to account for the FIP in Japanese. Most researchers (Nagahara, 1994; Uechi, 1998; Truckenbrodt, 1995; Selkirk, 2003; Sugahara, 2003) have been trying to explain these facts by treating FIP as an operation

that modifies the prosodic phrasing created by the Syntax-Prosody Mapping (Selkirk, 1984; Selkirk and Tateishi, 1988, 1991, etc.).

It will be pointed out that the previous accounts introduced in this chapter cannot capture certain effects of FIP (§2.3.3). According to Sugahara (2003), the given/new distinction of the post-FOCUS material plays a crucial role in determining whether there is a phrasing manipulation on the post-FOCUS material or not. Also, Shinya (1999) reports experimental data that cannot be explained under the phrasing accounts (§2.3.5).

Given all the discussion and considerations in this chapter, together with several observations to be made in Ch. 3, I will propose an analysis that does not refer to prosodic phrasing structure in Ch. 4. I will propose later in the thesis (Ch. 4) that the FIP is created by a set of phonological rules that manipulate relative prominence between the semantically focalized phrase and phrases that follows it.

2.1   Japanese Intonation Phonology: Background

In this section, I will introduce some basic notions in Japanese intonation phonology that will be relevant to the discussion in the thesis.

2.1.1   Prosodic Hierarchy

In order to facilitate the following discussion, we will assume the following *Prosodic Hierarchy* (Nespor and Vogel, 1986; Selkirk, 1984).

(1)   *Prosodic Hierarchy of Japanese*

Utterance (Utt)	[							]
Intonation Phrase (IP)	[	][						]
Major Phrase (MaP)[1]	[	][	][	][	][	]		
Minor Phrase (MiP)[2]	[	][	][	][	][	]		
Prosodic Word (PWd)	[	][	][	][	][	][	][	]

As we will see in §4.1, our claim in this thesis does not directly refer to any of these hierarchical levels. This hierarchy, however, is essential for the discussion of the earlier literature. We first look at the properties of the lowest level in (1), i.e., Prosodic Words (PWd), and move on to the higher levels.

2.1.2 Prosodic Word (PWd): Accented and Unaccented Words

Japanese *Prosodic Words (PWds)* can be divided into two types, *accented words* and *unaccented words*. The former contains a lexically specified H*L pitch accent, while the latter does not. The location of pitch accent (or its absence) distinguishes lexical items. A sequence of two morae, for example, may be three ways ambiguous, depending on whether the accent is located on the first mora, on the second, or neither.

(2)   *Prosodic Word (PWd) in Japanese*

    a.   hási-ga (HLL)[3] 'chopstick-NOM' — Accented PWd (H*L on the first mora)

    b.   hasí-ga (LHL) 'bridge-NOM' — Accented PWd (H*L on the second mora)

    c.   hasi-ga (LHH) 'edge-NOM' — Unaccented PWd (No H*L accent)

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[1] a.k.a. Intermediate Phrase

[2] a.k.a. Accentual Phrase

[3] This is a traditional auto-segmental representation of tone since Haraguchi (1977). This does not mean, however, that each mora is always associated with either H or L. Pierrehumbert and Beckman (1988) claimed that there is no tone spreading in Japanese, and that, the tones are more sparsely distributed in Japanese. I use this auto-segmental notation here just for an expository purpose to illustrate the contrasts among the three lexical items presented here.

2.1.3   Minor Phrase (MiP): Initial Lowering

Prosodic words are grouped into a *Minor Phrase (MiP, a.k.a. Accentual Phrase).* A Minor Phrase may contain at most one lexical pitch accent. Therefore, an accented word may form a single Minor Phrase by itself or possibly with unaccented words, but in principle never with other accented words.

The MiP is a domain of the *Initial Lowering* effect. Each MiP contains a phrasal H tone and a boundary L% tone. The phrasal H is realized on the second mora of the first prosodic word within the Minor Phrase (unless the first prosodic word has a lexical H*L pitch accent on the first mora, in which case the phrasal H is associated with the first mora). The boundary L% tone is realized on the first mora of the following Minor Phrase (Pierrehumbert and Beckman, 1988). Accordingly, the beginning of a Minor Phrase is always marked by L followed by H.[4]

In principle, many unaccented prosodic words can be grouped into a single Minor Phrase, since they do not have a lexical pitch accent. If a Minor Phrase contains more than three prosodic words, however, it tends to split to two or more Minor Phrases, each of which contains at most two or three prosodic words (Selkirk and Tateishi, 1988).

2.1.4   Major Phrase (MaP): Downstep and Syntax-Prosody Mapping

One or more Minor Phrases are then grouped into a *Major Phrase (MaP, a.k.a. Intermediate Phrase).* The Major Phrase has two important properties. First, the Major Phrase is the domain of *downstep* (a.k.a. *catathesis*), a sharp F_0-lowering effect induced by a H*L pitch accent. Within a MaP, the pitch register is lowered after each H*L pitch accent. If there is more than one pitch accent in a single MaP, downstep results in a staircase-like pitch contour. At the left boundary of a following MaP, the pitch register is reset to a full pitch

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[4]This is why the initial mora of (2b) and (2c) is realized as low. The initial lowering is also observed in the case of (2a), but not fully realized because the pitch accent H*L is associated with the same mora.

range.[5]

(3)　*MaP and downstep*[6]

Downstep within a MaP

$\downarrow$　$\downarrow$　　　　$\downarrow$　$\downarrow$

$(_{\text{MaP}}$ ▌$_{\text{Full}}$ ▌$_{\text{Ds}}$ ▐$_{\text{Ds}}$ $)$ $(_{\text{MaP}}$ ▌$_{\text{Full}}$ ▌$_{\text{Ds}}$ ▐$_{\text{Ds}}$ $)$

$\uparrow$

F_0 register reset at a left MaP boundary
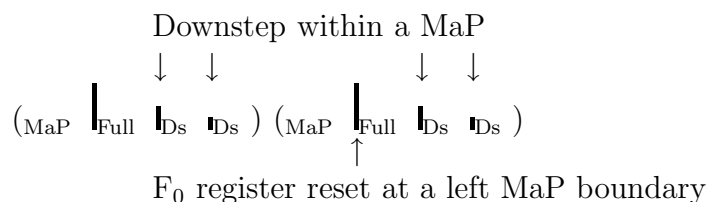
Second, the location of MaP boundary has a close correlation with the syntactic structure of the sentence. The left edge of MaP typically corresponds to the left edge of maximal projections (XP) in syntax (Selkirk, 1984; Selkirk and Tateishi, 1991).

(4)　*Syntax-Prosody Mapping (Selkirk and Tateishi, 1991)*

The left edge of an XP[7] must coincide with the left edge of a Major Phrase.

(Sugahara, 2003, p. 10)

For example, in the ditransitive sentence below, Major Phrase boundaries are observed at the left edge of TP, VPs, and DPs, but not at the left of the V head *anda* 'knitted'. Since there is no MaP boundary at the left of the V head, a verb head is usually subject to downstep.

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[5]Although there is a debate about the "cumulativity" of downstep (see McCawley, 1965; Selkirk and Tateishi, 1991 for non-cumulative view; Pierrehumbert and Beckman, 1988; Kubozono, 1993 for cumulative view), I will assume in this thesis that downstep is a cumulative phenomenon. That is, when there are three pitch accents within a single MaP, as in (3), the second pitch accent becomes lower than the first one, while the third one becomes lower than the second one. See Kubozono's (1993) argument for this view with experimental results. The discussion below, however, does not hinge on this assumption.

[6]In the example below and thereafter, black bars represent the schematic F_0 peaks. ▌$_{\text{Full}}$ denotes a peak is realized in full pitch range (i.e., no downstep), while ▌$_{\text{Ds}}$ denotes a peak with a downstep effect.

[7]Strictly speaking, "XP" in this definition should be interpreted as "branching XP." In a downstepping context in (6), for example, each Prosodic Word could count as an "XP," depending on the definition of the phrase structure. If these phrases count as "XPs," they should be all aligned to the left edge of MaPs. Then we would wrongly predict that there is no downstep in this case. By excluding all non-branching XPs from consideration, we obtain the desired results. See Uechi (1998, Ch. 2) for relevant discussion.

(5)   [TP [DP Aóyama-ga   ] [VP [DP aníyome-ni   ] [VP [DP erímaki-o] ánda   ]]]
             Aoyama-NOM   sister-in-law-DAT   scarf-ACC   knitted

     (MaP |Full   ) (MaP |Full   ) (MaP |Full |Ds   )

     'Aoyama knitted a scarf for his sister-in-law.'

                                          TP
                        DP   VP
            Aoyama-ga   DP   VP
                     aniyome-no   DP   V
                             erimaki-o   nonda
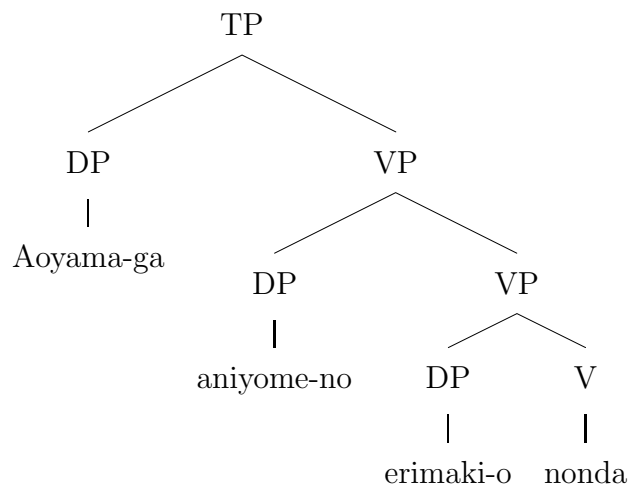
In a case of a sequence of genitive phrases, which creates a left-branching syntactic structure, such as (6), the second and the third phrase in the DP are not aligned to the MaP boundaries. As a result, these phrases are subject to downstep.[8]

(6)   [DP [DP [DP Aóyama-no   ] aníyome-no   ] erímaki-o]
               Aoyama-NOM   sister-in-law-GEN   scarf-ACC

     (MaP |Full |Ds |Ds   )

     'Aoyama knitted sister-in-law's scarf.'

                                DP
                      DP   erimaki
               DP   aniyome-no
           Aoyama-no

_____
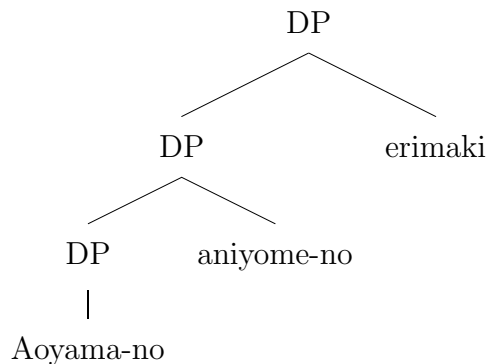
[8]In the syntactic tree given in (6), the phrase label *NP* for *aniyome-no* and *erimaki* is left out for expository purpose. These non-branching XPs should be excluded from the consideration in order to obtain the right result. See fn. 7.

The Syntax-Prosody Mapping is going to be an important part of the discussion in the later chapters.

2.1.5   Intonation Phrase (IP)

Intonation Phrase (IP) is the domain above the Major Phrase, by definition. The existence of this level in Japanese, however, is not a trivial issue, since no specific phonological phenomenon that takes IP as its domain has been found. In fact, Beckman and Pierrehumbert (1986) and Pierrehumbert and Beckman (1988) do not postulate Intonation Phrase (IP) for Japanese. However, in the IP-Prominence Analysis of focus intonation (Truckenbrodt, 1995; Selkirk, 2001, 2003; Sugahara, 2003), which we will review in detail in §2.3.2, it is claimed that the focused element bears an IP prominence. Since the existence of IP is assumed in the analyses that we will examine, I will assume this level, although this choice is not crucial for the claims to be made in this thesis.

2.2   Focus Intonation Pattern (FIP) in Japanese

There is more than one way to express "focus" even within a single language. In Japanese, for example, one way to express focus is to change the word order of the sentence (cf. Ishihara, 2000, 2001). Another option is to use certain focus-specific syntactic constructions such as Cleft construction (cf. Hiraiwa and Ishihara, 2002). Yet another option is to use a focus-specific intonation pattern—which is what we will discuss here. In this section, we will examine what a Focus Intonation Pattern in Japanese looks like.

2.2.1   Prosodic Focalization and Post-FOCUS Reduction

The following example is a simple illustration of FIP. (7a) shows a normal intonation without focalization of any phrase. (7b) is a case of FIP, where the second phrase (i.e., indirect object

phrase *aniyome-ni* 'sister-in-law-DAT') is semantically focalized (indicated by CAPS).[9] Their pitch contours are shown in Figure 2-1.[10]

(7)   a.   Aóyama-ga   aníyome-ni   erímaki-o ánda
              Aoyama-NOM sister-in-law-DAT scarf-ACC knitted

              'Aoyama knitted a scarf for his sister-in-law.'

    b.   Aóyama-ga   ANÍYOME-ni   erímaki-o ánda
              Aoyama-NOM sister-in-law-DAT scarf-ACC knitted

              'Aoyama knitted a scarf for his SISTER-IN-LAW.'

In (7a), where there is no focalization of any phrase, we can observe three clear F_0 peaks corresponding to the three argument DPs, plus, a rather small peak on the verb. As illustrated in (5) in the previous section, the Syntax-Prosody Mapping (4) requires the left edge of each argument phrase be aligned with left MaP boundaries, but does not align the left edge of the verb with a left MaP boundary. The F_0 peak on the verb, which is not a MaP-initial phrase, is realized with a small peak, due to *downstep*.

In the focus intonation in (7b), there are two important differences from the normal intonation in (7a). First, the F_0 peak on the semantically focalized phrase (*aniyome-ni* 'sister-in-law-DAT' in this case) becomes more prominent. The dative phrase thus exhibits a higher peak in (7b) than in (7a). Let us call this F_0-boosting phenomena on the semantically focalized element *Prosodic Focalization (P-focalization)*.

Another difference in F_0 realization appears after the focalized phrase. The F_0 peaks on the phrases following the focalized phrase are strongly reduced. This phenomenon can

[9]Throughout this thesis, I will only use accented words in examples unless specifically noted. This is because it is easier to observe FIPs with a sequence of accented words. This does not mean, however, an FIP never shows up with unaccented words. The realization is different and more subtle. See Pierrehumbert and Beckman (1988, Ch. 4) for discussion.

[10]The pitch tracks in Figure 2-1 are obtained from the recordings of the speech made by a native Tokyo Japanese speaker SS. I asked him to read the sentence presented on the computer screen. For (7b), I asked him to place an emphasis on *aníyome-ni*. Each pitch track is from one of the five utterances he made.

(7a) *No focalization*
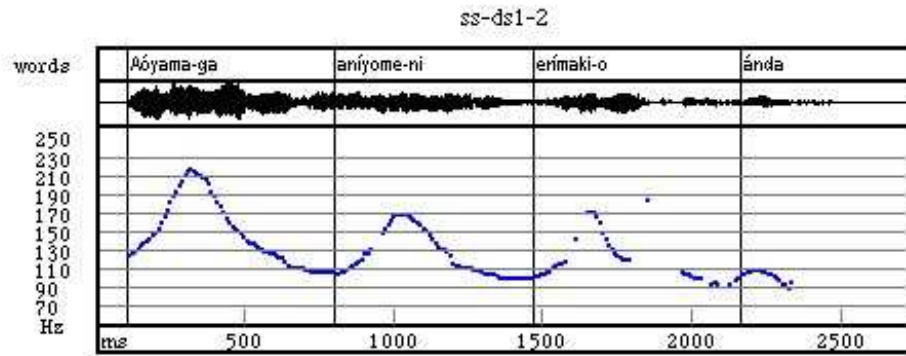
(7b) *Focalization on* aniyome-ni *'sister-in-law-*DAT*'*

Figure 2-1: FIP

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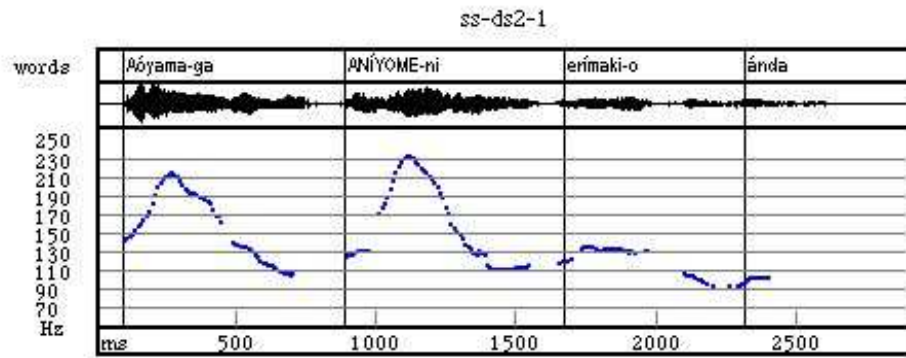
be observed clearly on the F_0 peak of the accusative phrase *erimaki-o* 'scarf-ACC'.[11] Let us call this F_0-lowering phenomenon on the material after the P-focalized element *Post-FOCUS reduction (PFR)*[12,13], adopting Sugahara's (2003) terminology.

In this thesis, I will adopt the distinction between contrastive focus (FOCUS, 'big' focus) and presentational focus (*focus*, 'small' focus[14]), proposed by Selkirk (2002, 2003). We will assume that FOCUS is the type of focus that creates an alternative set under the mechanism proposed by Rooth (1985, 1992, 1995). On the other hand, presentational *focus* denotes linguistic material that is contextually new (i.e., materials without *focus* are contextually given). I will also assume that the focus intonation pattern that we will discuss in the thesis is created by FOCUS. Although a *focus* element does not induce an FIP by itself, the existence/absence of *focus* has a substantial influence on the realization of FIP created by FOCUS. The new/given distinction (i.e., the existence/absence of *focus*) will be discussed in §2.3.4 and in §6.2.

We can generalize these two phenomena involved in FIP as follows:

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[11]We cannot detect a clear difference on the F_0 peak on the verb *anda* 'knitted', because the F_0 peak on the verb is already reduced due to downstep.

[12]In my previous work (Ishihara, 2002a,b; Hiraiwa and Ishihara, 2002), I have used the term *Deaccenting* to refer to this phenomenon. I no longer use this term because it could misleadingly imply deletion of pitch accents, which actually never happens. In Japanese, pitch accents carry lexical information, and in general cannot be deleted by any post-lexical operation. (There seems one exception, however, which we may call a real case of *Deaccenting*: a certain case of the so-called *Mo*-construction. We will look at this phenomenon in §3.3.2.) If pitch accents were completely deleted by 'deaccenting', we would predict that lexical contrasts made by location (or absence) of pitch accents, e.g., distinctions among *hási-ga* 'chopstick-NOM' (HLL), *hasí-ga* 'bridge-NOM' (LHL), and *hasi-ga* 'edge-NOM' (LHH), would disappear in the post-FOCUS domain, which is empirically not correct.

[13]Deguchi and Kitagawa (2002) call this phenomenon *eradication* of lexical accents. They claim that "when one or more lexical accents follow an emphatic accent [= a P-focalized element (S.I.)], their H tones (H*) are all suppressed (Deguchi and Kitagawa, 2002, p. 74)." In fact, however, there are cases where lexical pitch accents are detectable in a post-FOCUS domain, as we will see. Given that, this phenomenon should not be considered as complete deletion of pitch accents.

[14]For expository purpose, I will always use an italicized *focus* to refer to this feature. Non-italicized 'focus' is used in a more generic sense.

(8)   *Focus Intonation Pattern (FIP)*

    a. **P(rosodic)-focalization**

        The F_0 peak of an element bearing FOCUS is raised.

    b. **Post-FOCUS reduction (PFR)**

        The F_0 peaks of the material after the element bearing FOCUS are lowered.

How it is implemented phonologically will be proposed in §4.1.

2.3   Prosodic Phrasing Accounts of FIP

As we saw in (7), focus has effects on prosody, which have been observed by many researchers (Poser, 1984; Pierrehumbert and Beckman, 1988; Nagahara, 1994; Maekawa, 1997a; Uechi, 1998; Truckenbrodt, 1995; Sugahara, 2003, for Japanese). Most researchers try to account for this effect by claiming that focus modifies the prosodic structure by inserting or deleting prosodic phrasing boundaries (Nagahara, 1994; Uechi, 1998; Truckenbrodt, 1995; Selkirk, 2000; Sugahara, 2003). We may call these analyses *Prosodic phrasing accounts* of FIP. In this section, we will review these accounts.

We also look at certain effects that are not fully accounted for by the prosodic phrasing analyses. Sugahara (2003) demonstrates that independently of the effects on the prosodic structure (which she calls the *structural effect*), PFR has effects that are always found whether the prosodic structure is altered or not (the *non-structural effect*). We discuss the influence of the new/given distinction on prosody, which is claimed by Sugahara (2003). We also discuss Shinya's (1999) experimental finding that raises a problem for phrasing analyses.

2.3.1   Major Phrase (MaP) Phrasing Analysis

The first analysis we examine may be called the *MaP phrasing analysis.* In such an analysis, a FIP is analyzed as Major Phrase (MaP) boundary manipulation, which is explored by Nagahara (1994) and Uechi (1998). Their analysis is based on Pierrehumbert and Beckman's (1988) observation that F_0-raising on a FOCUS phrase blocks the downstep effect.

Pierrehumbert and Beckman (1988) claimed that a MaP boundary is created on the left of FOCUS, and hence blocks downstep.[15] Under this analysis, FIP is created by inserting a MaP boundary to the left of FOCUS, and deleting all the MaP boundaries on the right of FOCUS. Nagahara (1994, p. 42) proposes two Optimality Theoretic (Prince and Smolensky, 1993) constraints, which may be rephrased in rule-based terms for expository purpose as follows:

(9)   *MaP phrasing*

    a. *MaP Boundary Insertion Rule* (Nagahara's FOCUS-LEFT-EDGE)
        Insert a MaP boundary to the left of FOCUS (if there is none).

    b. *MaP Dephrasing (= MaP boundary deletion) Rule* (Nagahara's FOCUS-TO-END)
        Delete all the MaP boundaries on the right of FOCUS until the end of the sentence.

The MaP Boundary Insertion Rule (9a) will induce a MaP insertion to the left of FOCUS. The MaP Dephrasing Rule (9b) will delete all the MaP boundaries on the right of FOCUS. As a result of this MaP insertion/deletion operation, the FOCUS phrase and all the following phrases are grouped into a single MaP. Since MaP is a domain of downstep, all the pitch accents after the MaP-initial one (i.e., the one on the FOCUS phrase) will be subject to downstep.

Let us consider a case of MaP boundary insertion, illustrated in (10) below. In (10a), which has the same syntactic structure as (=(6) above, the entire DP constitutes a single MaP according to the Syntax-Prosody Mapping (4), because the left edges of XP only exist at the left of the first phrase α. In (10b), the second phrase β is focused. According to the MaP Boundary Insertion Rule (9a), a MaP boundary is created on the left of β_{FOC}. The newly created MaP boundary on the left of FOCUS will block the downstep effect, and

---

[15] Their observation and their claim based on it are in contrast with those of Poser's (1984), who did observe a downstep effect on the FOCUS phrase, and hence concluded that there is no MaP boundary to the left of FOCUS. We will return to this issue shortly. See §2.3.5.

hence, the FOCUS phrase will show up with a full pitch range (i.e., not downstepped), as in the case of β_{FOC} in (10b):

(10) *P-focalization: MaP boundary insertion on the left of FOCUS*

    a. Syntax: $[_{\text{DP}}$ $[_{\text{DP}}$ $[_{\text{DP}}$ α-GEN] β-GEN] γ-DAT]

       Prosody: $(_{\text{MaP}}$ |$_{\text{Full}}$ |$_{\text{Ds}}$ |$_{\text{Ds}}$)

    b. Syntax: $[_{\text{DP}}$ $[_{\text{DP}}$ $[_{\text{DP}}$ α-GEN] β_{FOC}-GEN] γ-DAT]

       Prosody: $(_{\text{MaP}}$ |$_{\text{Full}}$) $(_{\text{MaP}}$ |**$_{\text{Full}}$** |$_{\text{Ds}}$)
                                       ↑
                     MaP boundary insertion

PFR, on the other hand, is analyzed as downstep after MaP dephrasing induced by MaP Dephrasing Rule (9b). For example, in the case of (7b), repeated here with schematized pitch peaks, the MaP boundary at the left of direct object *erimaki-o* 'scarf-ACC' is deleted, inducing a downstep effect on this phrase.

(11) *PFR: MaP deletion after FOCUS*

    a. $[_{\text{TP}}$ $[_{\text{DP}}$ Aóyama-ga] $[_{\text{VP}}$ $[_{\text{DP}}$ aníyome-ni   ] $[_{\text{VP}}$ $[_{\text{DP}}$ erímaki-o] ánda]]]
            Aoyama-NOM   sister-in-law-DAT   scarf-ACC knitted

       $(_{\text{MaP}}$ |$_{\text{Full}}$) $(_{\text{MaP}}$ |$_{\text{Full}}$) $(_{\text{MaP}}$ |$_{\text{Full}}$ |$_{\text{Ds}}$)
       'Aoyama knitted a scarf for his sister-in-law.'

    b. $[_{\text{TP}}$ $[_{\text{DP}}$ Aóyama-ga] $[_{\text{VP}}$ $[_{\text{DP}}$ ANÍYOME-ni   ] $[_{\text{VP}}$ $[_{\text{DP}}$ erímaki-o] ánda]]]

       $(_{\text{MaP}}$ |$_{\text{Full}}$) $(_{\text{MaP}}$ |$_{\text{Full}}$ |**$_{\text{Ds}}$** |**$_{\text{Ds}}$**)
                                           ↑
                             MaP deletion

       'Aoyama knitted a scarf for his SISTER-IN-LAW.'

In short, under this analysis, the P-focalization is analyzed as a result of downstep-blocking induced by MaP boundary insertion, and the PFR as a result of downstep due to deletion of MaP boundaries.

This analysis, however, leaves a question. If P-focalization were simply MaP boundary insertion, it would not change the F_0 peak of a phrase that is already mapped at the left edge

of a MaP by the Syntax-Prosody Mapping, just as in the case of (11b). Although the MaP Dephrasing Rule can explain the PFR on the direct object, the MaP Boundary Insertion Rule does not explain the F_0-boosting effect on the indirect object. The FOCUS phrase in (11b) is already at the left edge of MaP. The rule therefore would not apply. Even if it applies, inserting a MaP boundary to a position that is already at a MaP boundary would not have any effect. Therefore no prosodic effect is expected. As we have already seen in (7) above, however, we do find an F_0-boosting effect on the FOCUS phrase even in such a context. The MaP boundary insertion analysis cannot capture this F_0-boosting effect.

There is another problem for this account. Nagahara (1994) assumes that the domain of PFR (i.e., the domain of MaP deletion, under his account) always continues until the end of the sentence. It is therefore assumed that the MaP dephrasing operation always applies until the end of the utterance. As we will see in the next chapter (§3.1.2), however, this assumption is not empirically correct. In some cases, the focus intonation does not continue until the end of the sentence. If such cases are to be taken into account under this analysis, some modification of the rule or an additional rule will be needed to allow such an intonation pattern. Since this will be a part of the main discussion in the thesis, I will relegate the detailed discussion until Ch. 4. It is sufficient at this point to keep in mind that PFR does not always continues until the end of the sentence, and that MaP Dephrasing Rule cannot capture this fact, at least as it is.

2.3.2 IP Prominence Theory (a.k.a. Focus-Prominence Theory)

Let us now examine the next analysis, which we will call here the *IP Prominence Theory*.[16]

The gist of this analysis is that the phrase assigned FOCUS will receive a prominence at the Intonation Phrase (IP) level, one level higher than the Major Phrase. Unlike the MaP phrasing analysis discussed in the previous section, this proposal can capture the F_0-boosting

---

[16]Selkirk (2003) calls this the *Focus-Prominence Theory*. We will call it here the *IP Prominence Theory* for expository purpose, since "Focus-Prominence Theory" could potentially represent other theories discussed in this section

effect on FOCUS in (11b), which is located at the MaP boundary.

Assignment of a prominence at the IP level to a FOCUS phrase will create an IP boundary on its left. In the case of (7b) again, repeated below, the FOCUS phrase is not only the most prominent phrase within a MaP (= leftmost phrase within a MaP), but also the most prominent phrase in an IP. This IP prominence is realized as a F_0-boosting effect, as shown in (7b). Accordingly, we can expect a higher F_0 peak on the FOCUS phrase in (7b) than the IO without FOCUS in (7a). The PFR is explained in the same way as the MaP phrasing analysis, namely, MaP dephrasing. Therefore, the MaP boundary on the right of FOCUS, i.e, the one on the left of DO, is deleted, inducing downstep on the DO.

(12) *IP prominence analysis*

a. *Sentence without FOCUS (No IP prominence)*[17]

$(_{IP}$)
$(_{MaP}$ $|_{Full}$ $)$ $(_{MaP}$ $|_{Full}$ $)$ $(_{MaP}$ $|_{Full}$ $|_{Ds}$ $)$
$[_{TP}$ $[_{DP}$ Aóyama-ga] $[_{VP}$ $[_{DP}$ aníyome-ni] $[_{VP}$ $[_{DP}$ erímaki-o] ánda]]]

b. *Sentence with FOCUS*

IP prominence assignment (P-focalization)
$\downarrow$ MaP boundary deletion (PFR)
$(_{IP}$ $)$ $(_{IP}$ | $\downarrow$)
$(_{MaP}$ $|_{Full}$ $)$ $(_{MaP}$ $|_{Full}$ $|_{Ds}$ $|_{Ds}$ $)$
$[_{TP}$ $[_{DP}$ Aóyama-ga] $[_{VP}$ $[_{DP}$ aníyome-ni] $[_{VP}$ $[_{DP}$ erímaki-o] ánda]]]

The basic concept of this analysis is the same as that of MaP phrasing analysis. FIP is explained as a consequence of prosodic structure manipulation. Since the proposals of this analysis are presented under the framework of Optimality Theory (Prince and Smolensky, 1993), let us look at the relevant constraints and their ranking. (I only introduce the constraints that are relevant for IP/MaP phrasing. There are a few more constraints to be introduced later.)

First, the Syntax-Prosody Mapping (4) is expressed by the following constraint.

---

[17]Selkirk (2002) claims that IP prominence is only assigned under FOCUS. This means that there may be IPs without prominence if there is no FOCUS.

(13) SYNTAX-PROSODY MAPPING—ALIGN$_L$(XP, MaP)

   The left edge of an XP must coincide with the left edge of a Major Phrase.

(Sugahara, 2003, p. 10)

This constraint is violated when there is an XP left edge that is not aligned with a MaP left edge. Such a violation is forced if a more highly ranked constraint requires such phrasing.

   The following two constraints, FOCUS-PROMINENCE and FOCUS-DEPHRASING, which outrank the SYNTAX-PROSODY MAPPING constraint, derives P-focalization and PFR, respectively, on this analysis.

(14) FOCUS-PROMINENCE

   The FOCUS-marked constituent in the morpho-syntactic representation should correspond to a string of the phonological representation which contains the highest prominence (DTE, Δ)[18] of an Intonational Phrase.

(Sugahara, 2003, p. 191)

(15) FOCUS-DEPHRASING—ALIGN$_R$(Δ_{IP}, IP)

   The DTE (Δ) of an Intonational Phrase must coincide with the right edge of an Intonational Phrase.

(Sugahara, 2003, p. 192)

FOCUS-PROMINENCE (14) requires that a FOCUS phrase be assigned a prominence at the IP level. The highest prominence is assigned to the leftmost element in IP, just as the leftmost phrase within a MaP bears the most prominent peak within that MaP. Therefore assignment of an IP prominence to FOCUS creates an IP boundary on the left of FOCUS.

   FOCUS-DEPHRASING (15), on the other hand, derives dephrasing effects. This constraint requires that the IP prominence be aligned to the right edge of an IP. Any kind of

---

[18]DTE (Designated Terminal Element) is defined as follows:

 (i) Designated Terminal Element (DTE, or Δ) (Sugahara, 2003, p. 15)
   DTE of a prosodic constituent C is the mora (i.e., the terminal prosodic node) that is dominated by the chain of heads of C.

phrase boundaries (including MaP and MiP boundaries) between an IP prominence (i.e., the FOCUS phrase) and the right edge of the IP would cause a violation. Such a violation would be avoided if all the MaP/MiP boundaries are deleted. Therefore this constraint induces the dephrasing effect.[19]

These two constraints outranks the Syntax-Prosody Mapping constraint in (13), so that FOCUS will change the prosodic structure.

(16)   FOCUS-Prominence, FOCUS-Dephrasing ≫ Syntax-Prosody Mapping

(Sugahara, 2003, p. 314)

(17)

$[_{\text{XP}} \quad \alpha_{\text{FOC}}]\,[_{\text{XP}} \quad \beta \quad]\,[_{\text{XP}} \quad \gamma \,]$	FOCUS-PROM.	FOCUS-DEPHRASE	SYN-PROS MAPPING
a. $(_{\text{IP}}$ $)$ $(_{\text{MaP}}$ $)\,(_{\text{MaP}}$ $)\,(_{\text{MaP}}$ $)$ α β γ	*!		
b. $(_{\text{IP}}$ $)\,(_{\text{IP}} \;\; \Delta_{\text{IP}}$ $)$ $(_{\text{MaP}}$ $)\,(_{\text{MaP}}$ $)$ α β γ	*!		*
c. $(_{\text{IP}} \;\; \Delta_{\text{IP}}$ $)$ $(_{\text{MaP}}$ $)\,(_{\text{MaP}}$ $)\,(_{\text{MaP}}$ $)$ α β γ		*!* (2 MaPs)	
☞ d. $(_{\text{IP}} \;\; \Delta_{\text{IP}}$ $)$ $(_{\text{MaP}}$ $)$ α β γ			**

In (17a), no IP prominence is assigned. FOCUS-Prominence requires one, as the FOCUS-marked phrase α_{FOC} needs to correspond to a prosodic phrase containing IP prominence. (This would be the optimal output if the input does not contain any FOCUS. Since all XPs are aligned with the MaP boundaries, this output satisfies Syntax-Prosody Mapping.) (17b) is also excluded by FOCUS-Prominence, because the IP prominence (Δ_{IP})

---

[19]According to Sugahara (2003), MiP boundaries on the left of an accented word always survives, even when MaP dephrasing takes place. In other words, pitch accents are never completely suppressed on the phonological representation. This observation eliminates the possibility of MiP dephrasing suggested in Pierrehumbert and Beckman (1988). Maekawa (1994, 1995) also reaches the same conclusion.

is assigned to a non-FOCUS phrase. In (17c), the IP prominence is appropriately assigned to α_{FOC}. This output, however, keeps the MaP boundaries on the right of the IP prominence. This will cause violation of FOCUS-Dephrasing. (17d), satisfies both FOCUS-Prominence and FOCUS-Dephrasing, because the IP prominence is appropriately assigned to α, and MaP dephrasing is taking place on the right of the IP prominence.

T/ summarize, under this analysis, a phrase bearing FOCUS is assigned an IP prominence, creating an IP boundary (and accordingly boundaries of all the lower levels, i.e., MaP and MiP). PFR is again treated as a dephrasing operation (= prosodic phrase boundary deletion). These operations are called for to satisfy the highly ranked FOCUS-related constraints (14) and (15).

2.3.3 Structural/Non-structural Effect of PFR

So far, we have reviewed two prosodic phrasing analyses of FIP. In this line of analysis, FIP is derived by modifying prosodic phrasing that is created by the Syntax-Prosody Mapping. There are, however, some effects that cannot be treated under this kind of analysis.

Sugahara (2003) has shown, in careful experiments, that there are both *structural* and *non-structural* effect of PFR. "Structural effect" refers to the effects that change the prosodic phrasing structure. The structural effect of the PFR, for example, is dephrasing, as we have seen above. "Non-structural effect" refers to effects that are observed independently of prosodic structure manipulation. Sugahara (2003) showed that a post-FOCUS domain always exhibits some F_0-lowering effect, regardless of whether the prosodic structure is changed by dephrasing or not. In principle, prosodic phrasing accounts we have reviewed so far can explain structural effects but not non-structural effects, because non-structural effects take place independently of prosodic phrasing.

2.3.4 Givenness

Whether the PFR shows a structural effect or not depends on whether the post-FOCUS material is contextually given (Schwarzschild, 1999) or new. According to Sugahara (2003), if
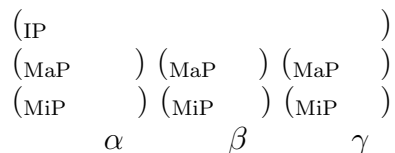
the post-FOCUS material is all new, all the MaP (as well as MiP) boundaries are maintained, i.e., no dephrasing takes place. Therefore no structural effect is observed in the post-FOCUS domain. When the post-FOCUS material is all given, on the other hand, the MaP boundaries disappear in the PFR domain.

Givenness by itself affects the F_0 realization of a phrase, independently of FIP (cf. Bader, 2001). In general, the amount of F_0 excursion from L tone to H tone in a Prosodic Word is smaller when the word is given than when it is new. In this case, however, it does not affect the prosodic structure of the material. MaP boundaries and MiP boundaries are all maintained. Givenness does not trigger dephrasing by itself. Sugahara (2003) calls it *non-structural effect of givenness.*

When givenness involves the realization of FIP, on the other hand, it does affect the prosodic structure of the material. In such cases, the *structural effect of givenness* comes into play. In a PFR domain, the MaP boundary is deleted only if the material is contextually given. If the post-FOCUS material is new, no MaP dephrasing takes place. This effect cannot be reduced to the result of the non-structural effect alone, because there is an additional effect observed only in post-FOCUS given material.

The effect is illustrated below. Suppose there is a sequence of three accented PWds, [α β γ]. Since the phrases are all accented, each creates a MiP boundary. Suppose further that all the phrases are at the left edge of XPs. The Syntax-Prosody Mapping (4) creates MaP boundaries on the left of each phrase.

(18)   *Three PWds with MiP/MaP boundaries*

$$
\begin{array}{llll}
(\text{IP} & & &)\\
(\text{MaP} &)\,(\text{MaP} &)\,(\text{MaP} &)\\
(\text{MiP} &)\,(\text{MiP} &)\,(\text{MiP} &)\\
& \alpha & \beta & \gamma
\end{array}
$$

Now, let us consider a case in which α bears FOCUS. When β and γ are contextually new material, as in (19a), then there is no dephrasing. On the other hand, when they are contextually given, as in (19b), MaP dephrasing takes place.

(19)   *Structural Effect of Givenness*

a.   *When the post-FOCUS material is new—No MaP dephrasing*

$$
\begin{array}{lll}
(_{\text{IP}} & &) \\
(_{\text{MaP}} &) (_{\text{MaP}} &) (_{\text{MaP}} &) \\
(_{\text{MiP}} &) (_{\text{MiP}} &) (_{\text{MiP}} &) \\
\quad \alpha_{\text{FOC}} & \beta_{\textbf{new}} & \gamma_{\textbf{new}}
\end{array}
$$

b.   *When the post-FOCUS material is given—MaP dephrasing*

$$
\begin{array}{lll}
(_{\text{IP}} & &) \\
(_{\text{MaP}} & &) \\
(_{\text{MiP}} &) (_{\text{MiP}} &) (_{\text{MiP}} &) \\
\quad \alpha_{\text{FOC}} & \beta_{\textbf{given}} & \gamma_{\textbf{given}}
\end{array}
$$

Note that the prosodic structure in (19a) is exactly the same as that of (18). If the post-FOCUS material is all new, there is no change in the prosodic structure. Sugahara (2003) however showed that even in this case, a PFR effect can be observed. This non-structural effect cannot be not fully explained under the prosodic phrasing analyses.

In (19b), on the other hand, MaP boundaries are deleted. Accordingly, downstep is expected on β and on γ. The pitch contour of (19b) is expected to be different from (19a), which does not show downstep effect.

Sugahara (2003) explains this fact by interaction of a few constraints. Given that the dephrasing effect is due to the FOCUS-Dephrasing constraint, the fact that contextually new material can block dephrasing indicates that there is a highly-ranked constraint that prevents dephrasing on the new material.

With an assumption that new material bears the presentational focus (i.e., 'small' *focus* compared to the contrastive 'big' FOCUS, see §p-foc-pfr), Sugahara (2003) proposes a constraint that the terminal string of *focus*-marked material corresponds to the left edge of MaP, which may be called *focus*-Prominence.

(20)   *focus*-Prominence—*focus*(XP)-Δ_{MaP}

The terminal string of a *focus*-marked XP (i.e., new XP) in the input syntactic

representation must correspond to a terminal string in the output phonological representation which contain the DTE (Δ) of a prosodic constituent Major Phrase.

The *focus*-Prominence constraint requires *focus* to be aligned to the left of MaP. This constraint functions in a parallel way to the FOCUS-Prominence in (20), which requires FOCUS to be aligned to the left of IP, and hence inserts an IP boundary on the left of FOCUS.

The *focus*-Prominence constraint outranks the FOCUS-Dephrasing constraint (i.e., $\text{Align}_R(\Delta_{IP}, IP)$). This essentially means new material blocks MaP dephrasing.

(21)   *focus*-Prominence $\gg$ FOCUS-Prominence, FOCUS-Dephrasing $\gg$ Syntax-Prosody Mapping

(Sugahara, 2003, p. 314)

From this, it is clear that givenness has a significant influence on the realization of FIP. In fact, Givenness will be an important key to the discussion in the later chapter (Ch. 6).

Also, when the post-FOCUS material is new, there is no change in prosodic structure. Nevertheless, there is F_0 lowering effect on the post-FOCUS material. Such non-structural effects cannot be captured by the prosodic phrasing account.

2.3.5   Shinya (1999): No MaP/IP Boundary at the Left of FOCUS

There has been a debate regarding whether P-focalization creates a MaP boundary or not. Poser (1984) claimed, based on his experimental data, that FOCUS does not block downstep. Pierrehumbert and Beckman (1988) have a counterargument, based on their experimental result. Pierrehumbert and Beckman (1988) claimed that FOCUS does create a MaP boundary on its left, blocking downstep. As we have seen, Pierrehumbert and Beckman's (1988) claim is carried over to the prosodic phrasing analyses. They analyze P-focalization as inserting a phrase boundary to the left of FOCUS.

Evidence in favor of Poser's (1984) claim would pose a problem for the prosodic phrasing accounts. An experimental finding by Shinya (1999) in fact provides such evidence. Shinya

(1999) has shown that a FOCUS phrase in a downstep context does show downstep effect, even though it may be suppressed by the pitch boosting effect of P-focalization. Recall that the domain of downstep is MaP. Therefore MaP-initial phrases have a downstep-blocking effect. If downstep is observed on the FOCUS phrase, it indicates that there is no MaP boundary insertion to the left of FOCUS.

Shinya (1999) compared the peak level of the FOCUS phrase (i.e., the fourth phrase) in the contexts of (22a) and (22b) below.[20,21]

(22)   a.   *Downstep case (with a sequence of accented words)*

         [[[[Aómori-no   ] áni-no   ] mégane-no] iró$_{FOC}$] desu
             Aomori-GEN   brother-GEN   glasses-GEN   color   COP

         '(It is) the COLOR of Aomori's brother's glasses.'

        b.   *No downstep case (with a sequence of unaccented words)*

         [[[[Oomori-no   ] ane-no   ] yunomi-no] iró$_{FOC}$] desu
             Oomori-GEN   sister-GEN   tea.cup-GEN   color   COP

         '(It is) the COLOR of Oomori's sister's tea cup.'

Both in (22a) and in (22b), the entire DP constitutes a single MaP, according to the Syntax-Prosody Mapping (4). The difference between them are the type of Prosodic Words (PWd). All the phrases preceding FOCUS are accented words in (22a), while they are all

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[20]These sentences are uttered by the experiment subjects as an answer to the following questions to ensure a focus interpretation on the fourth phrase:

(i)   a.   sore-ga [[[[Aómori-no   ] áni-no   ] mégane-no] futí-ni   ] niteiru   no desu ka?
           it-NOM   Aomori-GEN brother-GEN glasses-GEN frame-DAT look.alike C   COP Q
           'Is it similar to Aomori's brother's glasses' frame?'

      b.   sore-ga [[[[Oomori-no   ] ane-no   ] yunomi-no] moyoo-ni   ] niteiru no desu ka?
           it-NOM   Oomori-GEN sister-GEN   tea.cup-GEN pattern-DAT similar C   COP Q
           'Is it similar to Oomori's sister's tea cup's pattern?'

[21]Shinya (1999) subcategorized the types of focus adopting some of the subcategorization by Dik et al. (1981) and Erteshik-Shir (1997). Since he reports that the results did not differ among these subcategories, I only show one example here, which represents some kind of contrastive focus.

unaccented in (22b). Since downstep is triggered by H*L pitch accents, downstep is only expected in (22a).

If there were no FOCUS on the fourth phrase in (22a) and (22b), the F_0 peak would appear much lower in (22a) than in (22b), because only the former will be lowered by downstep, which is induced by the H*L pitch accents of the first, second, and third phrase.

Now, let us consider the test case in (22), where the fourth phrase bears FOCUS. If P-focalization is a result of MaP boundary insertion, no downstep effect would be expected on the FOCUS phrase in either case, because MaP boundary insertion on the left of FOCUS would block the downstep effect in (22a), and hence the difference would be no longer expected between the two examples.

The result of the experiment by Shinya (1999), however, contradicts this prediction. Even though the F_0 peak on FOCUS is realized higher compared to a non-focused case, the peak in (22a) is still lower than that of (22b). This means that the peak on FOCUS in (22a) still receives a downstep effect, even though it is boosted by P-focalization. If this observation is correct, it suggests that the source of the P-focalization is not due to the insertion of MaP, but something else.

In the earlier literature, both Poser (1984) and Pierrehumbert and Beckman (1988) tested this case by looking at contexts in which the FOCUS phrase immediately follows the MaP-initial phrase. Since only a single downstep process is expected in such a context, it is plausible that the P-focalization on FOCUS—which in fact could possibly be due to other than the lack of downstep—simply counterbalances the downstep effect, even though it is still at work. Shinya's (1999) experiment has an advantage over the two preceding works in that it successfully separates the effect of downstep and P-focalization.

The P-focalization effect without creating a MaP boundary could be considered as a non-structural effect of P-focalization. Regardless of whether P-focalization creates a MaP boundary or not, P-focalization always has a F_0-boosting effect. This is similar to the non-structural effect of PFR reported by Sugahara (2003).

2.4   Ch. 2: Summary

In this chapter, we briefly looked at what a FIP looks like, and reviewed earlier literature that explained prosodic phrasing analyses. In these analyses, FIP is analyzed as a prosodic structure manipulation phenomenon. FOCUS creates a phrase boundary (MaP or IP) on its left, and MaP dephrasing takes place on its right.

We have also seen that there are non-structural effects of PFR and P-focalization. Sugahara (2003) points out the existence of the non-structural effect of PFR. The dephrasing effect is only observed when the post-FOCUS material is given. Shinya's (1999) experimental result shows that P-focalization does not necessarily create a MaP boundary. The prosodic phrasing account, although it captures the structural effects of FIP, has no account for these effects.

In Ch. 4, I will propose an account for FIP in Japanese that does not refer to prosodic phrasing structure. I will in particular propose a pair of phonological rules that manipulate the prominence relation between a FOCUS phrase and post-FOCUS phrases. This analysis could work in tandem with the phrasing accounts to derive both structural and non-structural effects of FIP.

Before we move on to the proposal, we will discuss in Ch. 3 the intonation patterns of *wh*-questions in Japanese, in which FIP is crucially involved.

Chapter 3

Intonation of *Wh*-Constructions

In this chapter, we examine the intonation patterns of *wh*-questions in Japanese. The main purpose of this chapter is to familiarize ourselves with the facts about intonation of *wh*-questions. The facts that we examine in this chapter will be the basis of the discussion of the later chapters.

In this chapter, we will first confirm, by looking at sample data, that *wh*-questions exhibit FIP in their phonetic realizations. *Wh*-phrases are always P-focalized. Accordingly, post-*wh*-material displays PFR. It will be also shown that the PFR does not always continue until the end of the sentence. There are certain instances of PFR whose domain is restricted within an embedded clause. As we examine these cases of partial PFR, we will reach an important generalization: the domain of the PFR corresponds to the scope of the *wh*-question.

In addition to basic *wh*-question sentences, we further look at FIPs in multiple *wh*-questions. We will also look at another syntactic construction that involves the use of a *wh*-phrase, "*Mo*-construction" (Nishigauchi, 1990; Shimoyama, 2001; Hiraiwa, 2002, among others), which will provide us with further support for the generalization above.

Question particles in Japanese

Before going into the details of intonation of Japanese *wh*-questions, I introduce several types of question particles (Q-particles, hereafter) just to clarify which form I will use in the thesis.

At the matrix clause, Japanese has several types of Q-particle. Throughout the thesis, I will use *no* as the matrix Q-particle, as in (23), which is most commonly used in the literature. Since, all the Q-particles behave uniformly with respect to intonation, the following discussion does not hinge on this selection.

(23)   *'no'*

    a. *Yes/No-question*

        Náoya-ga   **nánika**-o   nomíya-de nónda **no**?
        Naoya-NOM something-ACC bar-LOC   drank Q

        'Did Naoya drink something at the bar?'

    b. Wh-*question*

        Náoya-ga   **náni**-o   nomíya-de nónda **no**?
        Naoya-NOM what-ACC bar-LOC   drank Q

        'What$_i$ did Naoya drink t_i at the bar?'

Another Q-particle *ka* may also appear in the matrix clause, but only with a polite verb ending form *V-más-* or *V-dés-*.

(24)   *'ka'*

    a. *Yes/No-question*

        Náoya-ga   **nánika**-o   nomíya-de nomi-mási-ta   **ka**?
        Naoya-NOM something-ACC bar-LOC   drink-POLITE-PAST Q

        'Did Naoya drink something at the bar?'

    b. Wh-*question*

        Náoya-ga   **náni**-o   nomíya-de nomi-mási-ta   **ka**?
        Naoya-NOM what-ACC bar-LOC   drink-POLITE-PAST Q

        'What$_i$ did Naoya drink t_i?'

According to Kuwabara (2001), the '*no*' form in (23) is a shortened form derived from the so-called *no da* construction, where the TP is followed by *no*, a copula *dés-*, and a Q-particle

ka.[1]

(25) a. *Yes/No-question*

Náoya-ga **nánika**-o nomíya-de nónda **no** (désu **ka**)?
Naoya-NOM something-ACC bar-LOC drank NO COP Q

'(Lit.) Is it that Naoya drank something at the bar?'

   b. Wh-*question*

Náoya-ga **náni**-o nomíya-de nónda **no** (désu **ka**)?
Naoya-NOM what-ACC bar-LOC drank NO COP Q

'What$_i$ did Naoya drink t_i?'

Kuwabara (2001) claims that *no* is not a real Q-particle, because there is a null Q-particle *ka* in the '*no*' form like (23)). We however treat both *no* and *ka* as Q-particles in the following discussion, for convenience sake. Furthermore, Kuwabara (2001) shows that the 'POLITE-*ka*' form and the '*no* (COP *ka*)' form have different syntactic structure, and hence exhibit different syntactic behavior (see also Hiraiwa and Ishihara, 2002, for the structure of the *no da* construction). The discussion in this thesis, however, does not hinge on this property. We will use the '*no*' form throughout the thesis.

In addition to the alternatives above, Q-particles may be omitted (Yoshida and Yoshida, 1996). In this case, Yes/No-questions are solely marked by intonation, especially by the

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[1]Also presumably derived from the *no da* construction, there is a particle only used in Yes/No-questions *nokai* and one only used in *wh*-questions *ndai* (Yoshida, 1998).

(i) a. *Yes/No-question—nokai*

Náoya-ga **nánika**-o nomíya-de nónda **nokai**/*****ndai**?
Naoya-NOM something-ACC bar-LOC drank $Q_{[Yes/No]}$/$Q_{[WH]}$

'Did Naoya drink something at the bar?'

   b. Wh-*question—ndai*

Náoya-ga **náni**-o nomíya-de nónda *****nokai**/**ndai**?
Naoya-NOM what-ACC bar-LOC drank $Q_{[Yes/No]}$/$Q_{[WH]}$

'What$_i$ did Naoya drink t_i?'

rising intonation at the end of the utterance.

In an embedded clause, the '*no*' form is unavailable. Q-particle drop is also not allowed. Accordingly, *ka* is obligatorily used. The polite verb ending form is generally unavailable in the embedded clause. Hence, *ka* appears with a non-polite form, as shown below.[2]

(26)   '*ka*' in embedded clauses

   Embedded Yes/No-question

a. Náoya-wa [Mári-ga **nánika**-o   nomíya-de nónda **ka**] ímademo
   Naoya-TOP Mari-NOM something-ACC bar-LOC   drank Q   even.now
   obóeteru
   remember

   'Naoya still remembers whether Mari drank something at the bar.'

b. *Embedded* wh-*question*

   Náoya-wa [Mári-ga **náni**-o   nomíya-de nónda **ka**] ímademo obóeteru
   Naoya-TOP Mari-NOM what-ACC bar-LOC   drank Q   even.now remember

   'Naoya still remembers what_i Mari drank t_i at the bar.'

For the indirect Yes/No-question, another particle *kadóoka* 'whether' may be used.[3]

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[2]The *no da* construction may be involved in the embedded clause as well.

(i)   '*no da*' in embedded clauses

a. *Embedded Yes/No-question*

   Náoya-wa [Mári-ga **nánika**-o   nomíya-de nónda **no** (da) **ka**] ímademo obóeteru
   Naoya-TOP Mari-NOM something-ACC bar-LOC   drank NO COP Q   even.now remember

   'Naoya still remembers whether Mari drank something at the bar.'

b. *Embedded* wh-*question*

   Náoya-wa [Mári-ga **náni**-o   nomíya-de nónda **no** (da) **ka**] ímademo obóeteru
   Naoya-TOP Mari-NOM what-ACC bar-LOC   drank NO COP Q   even.now remember

   'Naoya still remembers what_i Mari drank t_i at the bar.'

[3]According to Deguchi and Kitagawa (2002), some speakers allow the use of *kadóoka* for the indirect *wh*-question as well

(27)   *'kadóoka' in the embedded Yes/No-question*

Náoya-wa   [Mári-ga   **nánika**-o   nomíya-de nónda **kadóoka**] ímademo
Naoya-TOP   Mari-NOM something-ACC bar-LOC   drank whether   even.now
obóeteru
remember

'Naoya still remembers whether Mari drank something at the bar.'

    Throughout this thesis, I will use *no* as the matrix question particle, and *ka* for the embedded question.

3.1   FIP in *Wh*-questions

It has been noticed that *wh*-questions exhibit the FIP (Maekawa, 1991a,b, 1997b; Nagahara, 1994; Tomioka, 1997; Lee and Tomioka, 2001; Deguchi and Kitagawa, 2002; Ishihara, 2002a,b). In general, *wh*-phrases are P-focalized, while all the material after the *wh*-phrase exhibits PFR. In this section, we will look at several examples.

3.1.1   Single *Wh*-question

Let us start with a single-clause, single-*wh*-question. In (28) below, the second phrase in (28a) is an indefinite pronoun *nanika-o* 'something-ACC', while it is a *wh*-phrase in (28b).[4]

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[4]As we have already seen in some of the previous examples, in this thesis, indefinite pronouns will be mainly used in non-*wh*-question sentences as a *wh*-phrase counterpart. In Japanese, when a *wh*-phrase such as *nani* 'what' or *dare* 'who' is combined with a particle *ka*, the newly created phrase *WH-ka* becomes an indefinite pronoun *nanika* 'something' or *dareka* 'someone.'

(i)   a.   nani 'what' + ka = nanika 'something'

    b.   dare 'who' + ka = dareka 'someone'

    c.   doko 'where' + ka = dokoka 'somewhere'

    d.   itu 'when' + ka = ituka 'sometime'

Wh-phrases are obligatorily P-focalized, as we will see, while indefinite pronouns are not (just like other phrases). Since the *wh*-phrase and these indefinite pronouns only differ in terms of the existence/absence of

(28b) is also marked with a Q-marker *no* at the end of the sentence. Therefore (28a) is a non-interrogative sentence, while (28b) is a *wh*-question. The difference in the pitch contour is shown in Figure 3-1. (In the pitch tracks hereafter, the P-focalization is indicated by ⬆, and the PFR by ▭▭▭, respectively.)[5]

(28)   *Single* wh-*question*

a.   *Non-interrogative sentence*

Náoya-ga   **nánika**-o   nomíya-de nónda
Naoya-NOM something-ACC bar-LOC   drank

'Naoya drank something at the bar.'

b.   Wh-*question*

Náoya-ga   **náni**-o   nomíya-de nónda **no**?
Naoya-NOM what-ACC bar-LOC   drank Q

'What$_i$ did Naoya drink t_i?'

Due to the P-focalization on the *wh*-phrase, the F_0 peak on the *wh*-phrase in (28b) is more prominent (191Hz) than the corresponding indefinite phrase in (28a) (148Hz). Furthermore, the F_0 peak on the third phrase, i.e., the locative phrase *nomiya-de* 'at the bar', is lowered in (28b) (123Hz) due to the PFR, compared to the same phrase in (28a) (136Hz).

Even when a *wh*-phrase is in an embedded clause, if the sentence is a matrix *wh*-question, i.e., if the Q-particle binding the *wh*-phrase is at the end of the matrix clause as in (29b), the PFR effect spreads to all the post-FOCUS material, regardless of whether it belongs to the embedded clause or to the matrix clause. The locative phrase *nomiya-de* in the embedded clause, as well as the adverbial phrase *imademo* 'even.now/still' in the matrix clause, are both post-FOCUS-reduced. The contours of (29a) and (29b) are given in Figure 3-2.

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ka, and they make a good minimal pair.

[5]Almost all the pitch tracks given hereafter are obtained from the recordings of the experimental subjects' utterances. A few are recordings of my own speech. One of these exceptions is in (28). These exceptions will be noted as they appear.

(28a): Non-interrogative sentence
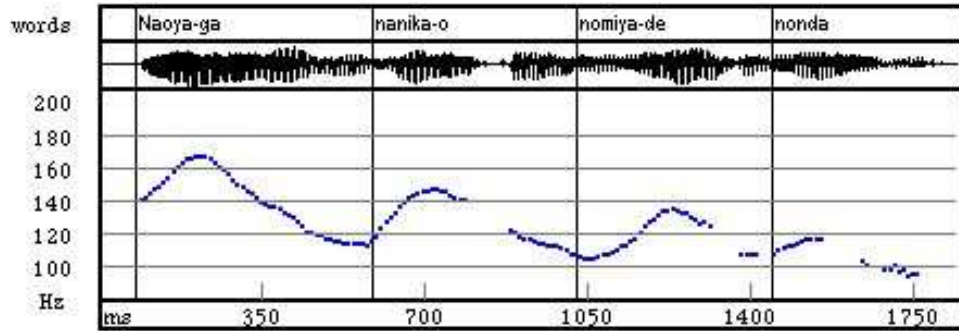
(28b): *Wh*-question
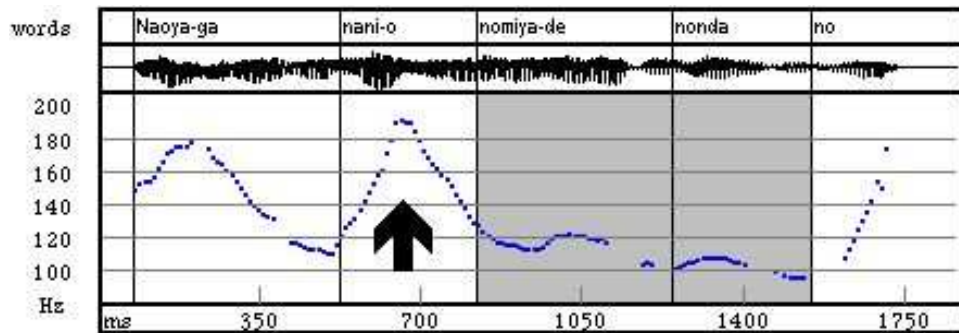
Figure 3-1: Single *wh*-question

(29)   Wh-*phrase in the embedded clause*

a.   *Non-interrogative sentence*

Náoya-wa   [Mári-ga   **nánika**-o   nomíya-de nónda to] ímademo
Naoya-TOP   Mari-NOM something-ACC bar-LOC   drank that even.now
omótteru
think

'Naoya still thinks that Mari drank something at the bar.'

b.   Wh-*question*

Náoya-wa   [Mári-ga   **náni**-o   nomíya-de nónda to] ímademo omótteru
Naoya-TOP   Mari-NOM what-ACC bar-LOC   drank that even.now think

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no?
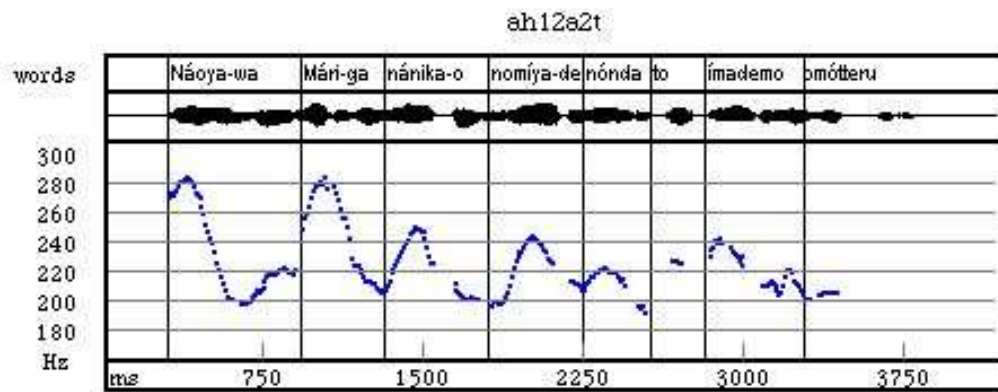Q

'What$_i$ did Naoya still think that Mari drank t_i at the bar?'

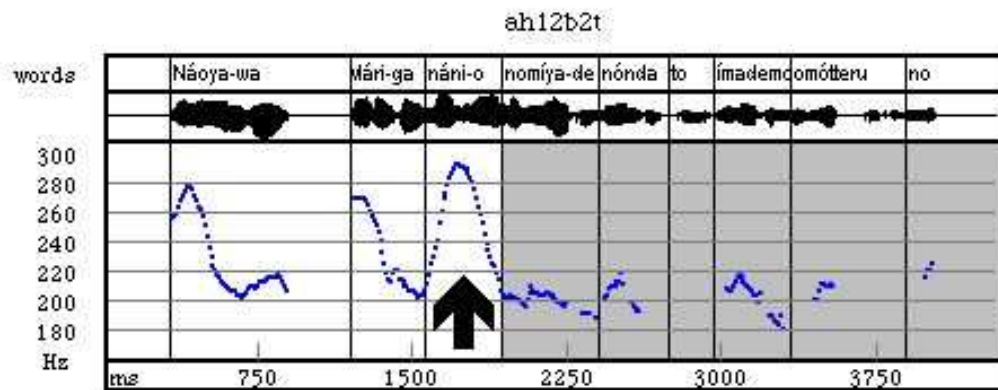(29a): Non-interrogative sentence

(29b): *Wh*-question

Figure 3-2: *Wh*-phrase in the embedded clause

3.1.2 Indirect *Wh*-question

The FIP is also found in the indirect *wh*-question. In the case of indirect *wh*-question, however, the PFR does not continue until the end of the sentence. The PFR stops at the end of the embedded clause, where the embedded Q-particle *ka* appears. This fact has been also noticed by several other researchers (Tomioka, 1997; Deguchi and Kitagawa, 2002; Kitagawa and Tomioka, 2003) and investigated independently. Let us look at actual pitch contours.

(30a) is an instance of an indirect Yes/No-question, where a Q-particle is located at the end of the embedded clause that contains no *wh*-phrase. In contrast, (30b) is an instance of the indirect *wh*-question, where the embedded clause headed by a Q-particle *ka* contains a *wh*-phrase *nani-o* 'what-ACC'. An FIP is not required in the former, while it is in the latter. Accordingly, we expect a contrast in their pitch contours. In fact, we can observe a clear contrast between (30a) and (30b) as in Figure 30.

(30)   a. *Indirect Yes/No-question*

        Náoya-wa [Mári-ga **nánika**-o   nomíya-de nónda ka] ímademo
        Naoya-TOP Mari-NOM something-ACC bar-LOC   drank Q even.now
        obóeteru
        remember

        'Naoya still remembers whether Mari drank something at the bar.'

   b. *Indirect* wh-*question*

        Náoya-wa [Mári-ga **náni**-o   nomíya-de nónda **ka**] ímademo obóeteru
        Naoya-TOP Mari-NOM what-ACC bar-LOC   drank Q even.now remember

        'Naoya still remembers what₍ᵢ₎ Mari drank t₍ᵢ₎ at the bar.'

It should be noted, however, the PFR in (30b), which is not found in (30a), only continues up to the end of the embedded clause, where the embedded Q-particle *ka* appears. The F_0 of the following phrase *imademo* 'even.now', which belongs to the matrix clause, is realized

(30a): Indirect Yes/No-question
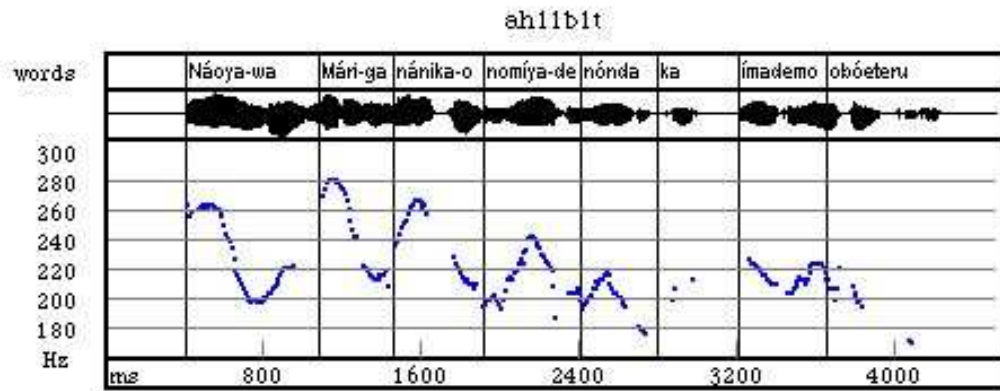
(30b): Indirect *wh*-question

Figure 3-3: Indirect *wh*-question (1)

in a full pitch, displaying a pitch reset phenomenon. Hence, the F_0 height of this phrase shows no difference between (30a) and (30b) (both being around 230–240Hz).

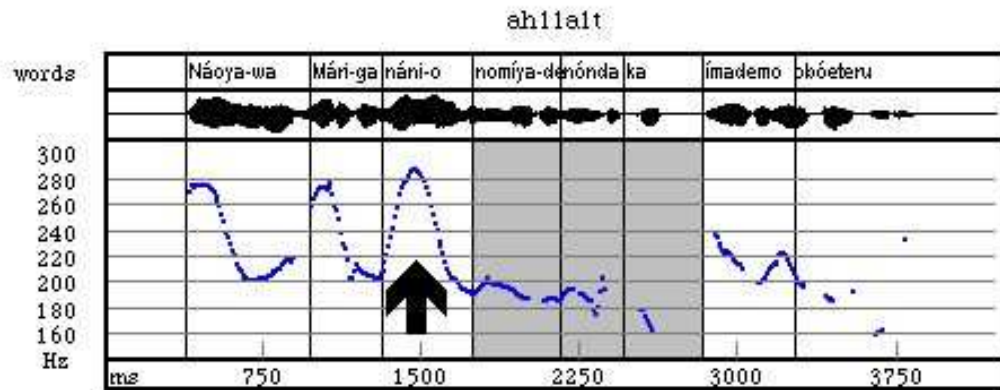One might suspect that the pitch reset on *imademo* is due to its focus-sensitive meaning 'even.now'. In the experiment, the same results are obtained in other examples in which other words are used in this position. (31) and a pair of pitch tracks in Figure 3-4 are from another example set used in the experiment.

(31)   a. Náoya-wa [Mári-ga **dáreka**-o   ruumuméito-ni eránda **ka**] Yúuzi-ni
           Naoya-TOP Mari-NOM someone-ACC roommate-DAT chose Q   Yuji-DAT
           tazúneta
           asked

           'Naoya asked Yuji whether Mari chose someone as her roommate.'

   b. Náoya-wa [Mári-ga   **dáre**-o ruumuméito-ni eránda **ka**] Yúuzi-ni
           Naoya-TOP Mari-NOM who-ACC roommate-DAT chose Q   Yuji-DAT
           tazúneta
           asked

           'Naoya asked Yuji who_i Mari chose t_i as her roommate.'

Note also that in (29b) above, where the PFR continues until the end of the sentence, *imademo* is clearly reduced. This pitch contour shows a clear contrast to that of (30b). If the non-reduced peak on (30b) is due to the meaning of *imademo*, they should be the same.

The statistical data in my experiment also supports my analysis. The pitch reset on the phrase immediately following the embedded clause is consistently observed in the majority of speakers (3 of 5 subjects[6]). The results of the experiment are discussed in detail in §5.

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[6]As for one of the two subjects whose data did not show the pitch reset (CS), there were some indications of the additional FOCUS assigned to some phrase independently of the one on the *wh*-phrase. It is therefore conceivable that this extra FOCUS creates an FIP of its own and obscures the FIP for the *wh*-question. In the other speaker's data (MN), expected contrasts between the *wh*-question and the non-*wh*-question generally could not be detected elsewhere. See the discussion of the data by CS and MN in §5.4.3 and §5.4.5, respectively

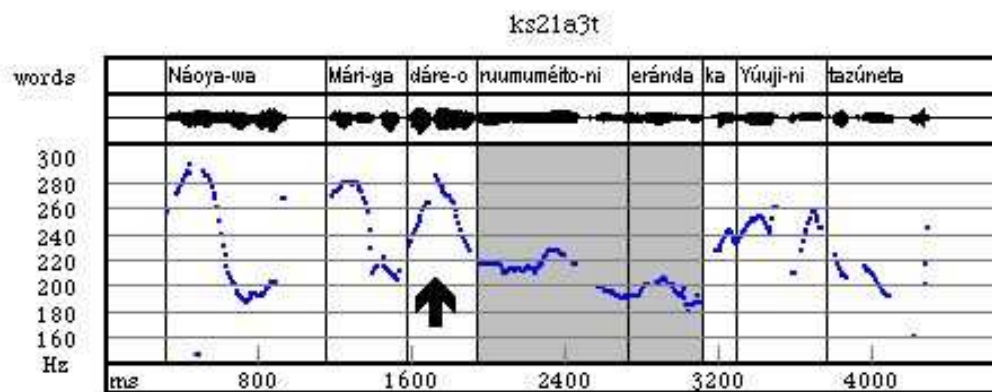(30a): Indirect Yes/No-question

(30b): Indirect *wh*-question

Figure 3-4: Indirect *wh*-question (2)

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(See §5.2. The example type A in the discussion in §5 corresponds to (30b) here, while the example type B corresponds to (30a).)

This fact that the FIP in the indirect *wh*-question stops at the end of embedded clause is particularly important for the rest of this thesis, since it raises interesting questions regarding the domain of FIP, as well as its interaction with syntactic/semantic properties of focus and *wh*-questions. In the next section, we delve into this partial FIP and its interesting correlation with the scope of *wh*-questions.

3.2   FIP and *Wh*-scope

As we have seen in the previous section, *wh*-phrases always exhibit P-focalization and are followed by PFR. Furthermore, we have also confirmed that the PFR continues until the end of the sentence in the matrix *wh*-question, while it stops at the end of the embedded clause in the indirect *wh*-question.

This fact leads us to a generalization that the domain of FIP corresponds to the scope of the *wh*-question, and more generally, to the scope of FOCUS.[7]

(32)   *FIP–*Wh*-scope Correspondence*
        The domain of FIP corresponds to the scope of *wh*-question.

3.2.1   Disambiguating *Wh*-scope Ambiguity

There is a good test case for the generalization in (32). It is schematically shown in (33). When there is a *wh*-phrase in an embedded clause, and both the embedded and the matrix clause are headed by a Q-particle, the sentence may have two interpretations, depending on which of the two Q-particles binds the *wh*-phrase. If the *wh*-phrase in the embedded clause is bound by the embedded Q-particle *ka*, as in (33a), this WH-Q binding relation yields

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[7]A similar idea is explored in Truckenbrodt (1995, Ch. 4), where he claims that the scope of FOCUS (in the sense of Rooth, 1985, 1992, 1995) corresponds to the phonological domain in which focus prominence is assigned.

an indirect *wh*-question reading. The matrix Q-particle *no* is then interpreted as a Yes/No Q-particle. The sentence as a whole becomes a Yes/No-question containing an indirect *wh*-question. If, on the other hand, the *wh*-phrase is bound by the matrix Q-particle, as in (33b), the sentence becomes a matrix *wh*-question containing an indirect Yes/No-question, where the embedded Q-particle *ka* is interpreted as 'whether'.

(33)   *Ambiguous configuration*

[... [... WH ... **ka**(Q_{emb})] ... **no**(Q_{mat})]

a.   *Yes/No-question containing an indirect* wh-*question*

[... [... WH ... **ka**(Q_{emb})] ... **no**(Q_{mat})]

b.   *Matrix* wh-*question*

† [... [... WH ... **ka**(Q_{emb})] ... **no**(Q_{mat})]

As one might notice, (33b) contains a *wh*-island configuration, which causes ungrammaticality in many languages including English. The judgment status of the *wh*-island effect in Japanese reported in the literature, however, varies from researcher to researcher. Takahashi (1993), for example, judged a sentence like (33b) as fully acceptable, while Nishigauchi (1990) and Watanabe (1992) judge it with certain degree of unacceptability. For the time being, we assume here that Japanese does not have the *wh*-island effect, following the judgement of those (including myself) who find sentences like (33b) acceptable. Throughout this thesis, this variant judgement status attributed to the (apparent) *wh*-island effect will be marked with '†', indicating that judgments may vary from 'fully acceptable' to *?.

The generalization (32) makes an interesting prediction regarding the intonation pattern of this sentence. Since the scope of the *wh*-question is different between the two readings, the intonation pattern should be also different between the two readings. In (33a), where the *wh*-phrase takes embedded scope, the domain of FIP is restricted in the embedded clause. Therefore, the PFR is expected to stop at the end of the embedded clause. A pitch reset is expected after the embedded clause. In (33b), in contrast, the *wh*-scope is the matrix clause. Therefore the PFR should continue until the end of the matrix clause. This prediction is in

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fact borne out. (34) is an actual example that has the configuration in (33). As shown in Figure 3-5, this sentence has two different intonation patterns for the two different readings.[8]

(34)   *Two intonation patterns for the two readings*

Náoya-wa [Mári-ga **náni**-o   nomíya-de nónda **ka**] ímademo obóeteru **no**?
Naoya-TOP   Mari-NOM what-ACC bar-LOC   drank Q   even.now remember Q

a.   'Does Naoya still remember what$_i$ Mari drank t_i at the bar?'

b.   † 'What$_i$ does Naoya still remember whether Mari drank t_i at the bar?'

(34a): 'Does Naoya still remember what$_i$ Mari drank t_i at the bar?'
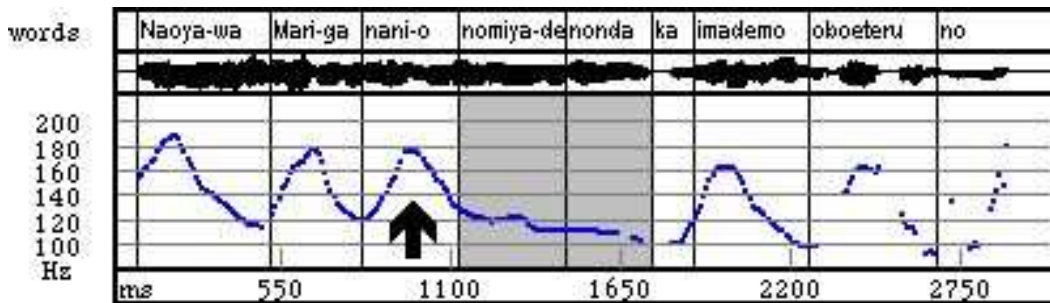
(34b): 'What$_i$ does Naoya still remember whether Mari drank t_i at the bar?'
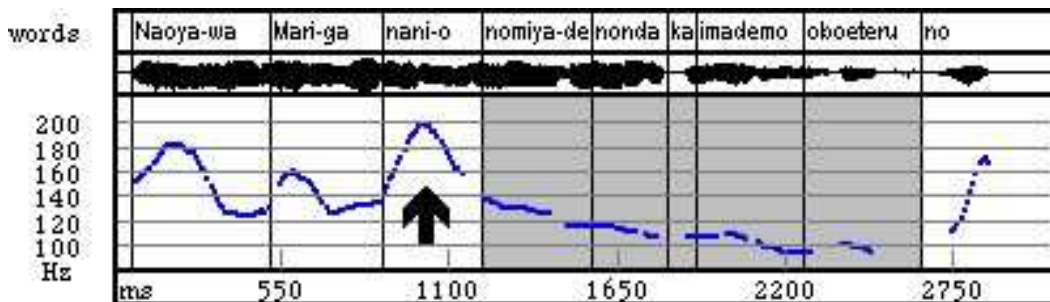
Figure 3-5: Two intonation patterns for the two readings

In (34a), where the *wh*-phrase takes the embedded scope, the PFR stops at the end of the embedded clause. After the embedded Q-particle *ka*, the pitch range is fully regained. With

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[8]The pitch tracks in these examples are recordings of my speech.

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this pitch contour, the indirect *wh*-question reading is the only possible interpretation. The matrix *wh*-question reading is impossible.

In (34b), where the *wh*-phrase takes the matrix scope, the PFR continues until the end of the matrix clause, where the matrix Q-particle *no* and the sentence final rising intonation appears.[9] The matrix *wh*-question reading is only available with this intonation given in (34b). This fact shows a strong correlation between the domain of FIP (of particular importance is the domain of the PFR) and the scope of the *wh*-question.[10]

[9]I will maintain that the domain of the PFR continues until the end of the sentence, even though it does not appear to continue until the Q-particle, on which the rising intonation appears. The rising intonation at the end of the question sentences is a kind of phrase boundary tone, which is assigned to a right edge of certain phrase boundary, not to a particular word or a Q-particle. In fact, if the Q-particle is dropped, which is a possible option in Japanese questions (Yoshida and Yoshida, 1996), this rising intonation appears at the final mora of the verb. The existence of the rising intonation on the Q-particle is just a coincidence of the location of the Q-particle and the right edge of the prosodic phrase, Utt or IP, whichever the rising intonation originates from.

[10]According to Aarons (1994), American Sign Language (ASL) shows a similar phenomenon in terms of the domain of the certain facial expression observed in *wh*-questions. In ASL, which optionally allows *wh*-in-situ, *wh*-scope is marked by a certain facial expression. If the sentence has an indirect *wh*-question reading, the facial expression starts at the beginning of the embedded clause. If the sentence has a matrix *wh*-question reading, the facial expression starts at the beginning of the matrix clause. (In the example below, the domain of the facial expression is indicated by $\overline{\text{overline}}$.)

(i)   *Facial expression in ASL*

    a.   *Indirect* wh-*question*

       TEACHER WONDER $\overline{\text{WHO PASS TEST}}$

       'The teacher wonders who passed the test.'

                                                 (Aarons, 1994, p. 114, ex. 37)

    b.   *Matrix* wh-*question*

       $\overline{\text{TEACHER WONDER WHO PASS TEST}}$

       'Who does the teacher wonder (if) passed the test.'

                                                 (Aarons, 1994, p. 115, ex. 40)

This claim, which has been made in Ishihara (2002a,b), has been challenged by Hirotani (2003), who presented experimental data to show that the correlation between the intonation and the scope is not as strong as predicted from the FIP-*Wh*-scope Correspondence given above. She conducted a perception test, in which the subjects listen to the sentences with the same configuration as (34) with one of the two different intonation patterns, (34a) or (34b), and are asked to choose the appropriate answer for each question. The choices of answers provided are something like "Yes, he did." (an answer for a Yes/No-question) or "A new jacket." (an answer for a *wh*-question). If the subjects interpret the sentence they hear as a Yes/No-question containing an indirect *wh*-question, they would use the former answer; if they interpret it as a *wh*-question, they would choose the latter.

According to the results of her experiment, with the partial FIP (where the PFR stops at the embedded clause), i.e., (34a), the embedded reading is the highly preferred reading (84.05%). This is in accordance with the FIP-*Wh*-scope Correspondence. With the other intonation pattern, where the PFR continues until the end of the sentence, however, she found no preference for one reading over the other (43.52% is interpreted as an embedded question). If there is a correspondence between the FIP and the *wh*-scope, the matrix *wh*-question reading should be preferred in the second case, as much as the embedded reading is preferred in the first case. From this fact, Hirotani (2003) argues against the FIP-*Wh*-scope Correspondence.

There are, however, several possible reasons for this lack of preference for the matrix *wh*-question reading in the second case. First, the intonation pattern similar to (34b) could in principle be used for the embedded *wh*-question reading. It is possible that the *wh*-phrase bears an extra FOCUS independent of the one associated with the indirect *wh*-question interpretation, and this extra FOCUS takes a matrix scope, inducing PFR that continues until the end of the sentence. In such a case, even though the PFR induced by the FOCUS associated with the indirect *wh*-question interpretation does not affect the F_0 of the matrix material after the embedded clause (i.e., *imademo* in (34)), the PFR induced by the extra FOCUS reduces it.

With the partial FIP (34a), on the other hand, there is no possibility of interpreting it as the matrix *wh*-question reading. If the *wh*-phrase takes the matrix scope, it would induce PFR until the end of the sentence. When the matrix material after the embedded clause, e.g., *imademo*, shows pitch reset as in (34a), it assures that the FOCUS on the *wh*-phrase is takes the embedded scope. Therefore there is no ambiguity with this intonation pattern.[11,12]

In addition to that, we have to be careful about the (potentially apparent) *wh*-island effect mentioned above. If there is a *wh*-island effect in (34b), the matrix *wh*-phrase reading is generally a dispreferred interpretation. Kitagawa and Fodor (To appear) explore this '*wh*-island' problem from the sentence processing viewpoint. They claim that there is a preference for the indirect *wh*-question reading (33a) over the matrix *wh*-question reading (33b) due to several factors. With these factors biasing against the matrix *wh*-question reading, along with the fact that the intonation pattern in (34b) can be potentially interpreted as the indirect *wh*-question, we expect a certain degree of bias toward the indirect reading with the pitch contour in (34b).

If the intonation pattern in (34b) itself has no preference for one reading over the other, as Hirotani (2003) claims, we would expect that the actual chance of (34b) being interpreted as the embedded *wh*-question be higher than being interpreted as the matrix, because there are other factors that favor the embedded *wh*-question reading.

If we take into consideration the factors biasing the indirect *wh*-question readings, Hirotani's (2003) experimental result could be reinterpreted. Given that there is a preference for the indirect *wh*-question readings for a sentence like (33), the lack of such a preference (*only* 43.52% interpreted as the indirect *wh*-question) when the PFR continues until the

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[11]One might consider a possibility that the matrix material immediately after the embedded clause, i.e., *imademo* in the case of (34), bears a FOCUS, while the FOCUS on the *wh*-phrase takes a matrix scope. If such a case exists, the PFR after the *wh*-phrase is supposed to continue until the end of the sentence, but it would be interrupted by the P-focalization of *imademo*. Then we would expect a pitch contour similar to (34b), with the matrix *wh*-question reading. Such a possibility, however, does not seem to be allowed. The unavailability of this possibility seems closely related to the discussion in Ch. 6, where we discuss cases where two *wh*-phrases takes different scopes.

[12]Thanks to Danny Fox for pointing this out.

end of the sentence as in (34b) indicates that this intonation pattern favors the matrix *wh*-question reading despite these factors. The apparent lack of the expected preference for the matrix *wh*-question reading is due to certain processing factors that bias the other reading.

3.3 More *Wh*-constructions

There are a few more cases we need to examine. The first case is the multiple *wh*-question. An experiment was carried out to clarify the validity of the two different observations in the earlier literature about the intonation pattern of multiple *wh*-construction. The second case is the so-called *Mo*-construction, where a *wh*-phrase is semantically bound by a particle *mo* to form a universal quantifier or an NPI (Nishigauchi, 1990; Shimoyama, 2001; Hiraiwa, 2002, among others). The *Mo*-construction not only exhibits the usual FIP that *wh*-questions do, but also exhibits a phenomenon that appears to be an instance of 'deaccenting' in the literal sense (i.e., pitch accent deletion).

3.3.1 Multiple *Wh*-question

In the case of the multiple *wh*-question, all *wh*-phrases are P-focalized. As for the PFR, however, there are two different observations in the literature. Nagahara (1994) noted that there is no PFR (under his analysis, no MaP boundary deletion) between the *wh*-phrases in multiple *wh*-questions. Ishihara (2002a,b) followed Nagahara (1994) in this respect, claiming that the PFR only takes place after the rightmost *wh*-phrase. Deguchi and Kitagawa (2002), on the other hand, claimed that there *is* PFR even between the two *wh*-phrases.

Since there was no experimental data to confirm the claims made in any of these previous works (and anywhere else, as far as I know), I conducted an experiment. Using five pairs of the sentences like (35) below, the F_0 peak on the second phrase was compared. (See Appendix A for full set of stimuli.)

(35) a. **dáre**-ga ano yóru[13] **náni**-o   nomíya-de nónda **no**?
          who-NOM that night   what-ACC bar-LOC   drank Q
          'Who drank what at the bar that night?'

b. Náoya-wa   ano yóru **náni**-o   nomíya-de nónda **no**?
   Naoya-TOP that night what-ACC bar-LOC   drank Q

   'What did Naoya drink at the bar that night?'

Let us consider the following configuration:

(36)   *Multiple* Wh-*question vs. Single* wh-*question*

   a.   [WH1 ... X ... WH2 ... Q?]

   b.   [Non-WH ... X ... WH ... Q?]

If there is no PFR between WH1 and WH2 in the multiple *wh*-questions (36a), the F_0 peak of X in (36a) and (36b) should be the same. If, on the other hand, there is a PFR between the two *wh*-phrases in (36a), the F_0 peak of X should be realized lower in (36a) than in (36b).

The result of the experiment reveals that the PFR effect is observed between the two *wh*-phrases, in favor of Deguchi and Kitagawa's (2002) observation. In the data of all five subjects, a statistically significant difference is found between the F_0 peak of X in (36a) and the one in (36b). The former is much lower than the latter, as the sample pitch contours given in Figure 3-6 show.

(37)   *The F_0 peak on the second phrase (P2)*

Subjects	P2 in (36a)	P2 in (36b)	Mean diff.	p	Statistically ...
AH	234.3	250.7	16.3	p < 0.0002	Significant
CS	220.6	240.0	19.4	p < 0.0002	Significant
KS	240.9	267.2	26.3	p < 0.0001	Significant
NM	215.1	236.5	21.5	p < 0.0002	Significant
YY	139.3	151.4	12.1	p < 0.0003	Significant

Deguchi and Kitagawa (2002) call this intonation pattern *Embedded EPD* (EPD = Emphatic Prosody, their term for FIP), implying that one FIP is embedded in another. If that

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[13] *ano yóru* 'that night' are in fact two words. However, since *ano* 'that' is an unaccented word, these two words together form a single Minor Phrase. They also constitute a Major Phrase in this case, because the syntax-prosody mapping requires there be a MaP boundary before *ano yóru* and before *nani-o* 'what-ACC'.

(36a): Multiple *wh*-question
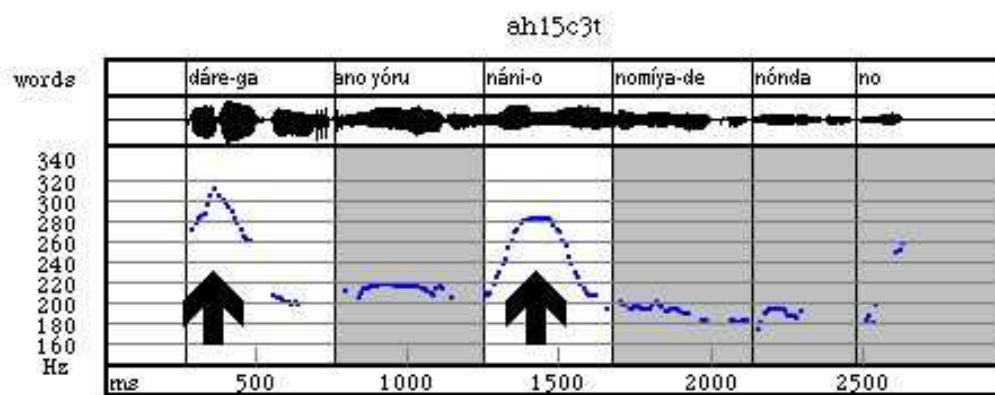
(36b): Single *wh*-question

Figure 3-6: Multiple *wh*-question

is in fact the case, however, the P-focalized phrase in the embedded FIP should be lowered due to the PFR of the embedding FIP. This means that the peak of the second *wh*-phrase in (36a) is reduced due to the PFR induced by the first *wh*-phrase.

This prediction, however, does not seem to be correct. The peak on the second *wh*-phrase is in fact slightly lowered in all speakers' data, as shown in (38). The data of only one speaker (CS) exhibit a sta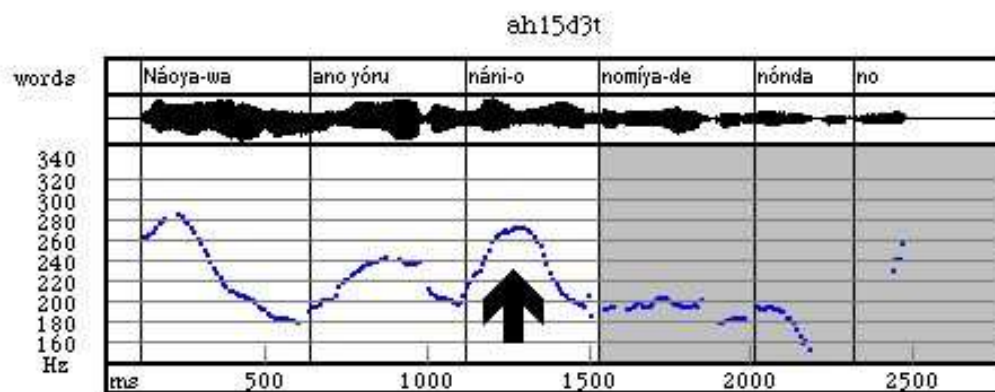tistically significant difference between the second *wh*-phrase in (36a) and the corresponding *wh*-phrase in (36b).[14] The other subjects' data do not show a significant difference between the two.

(38)   *The F_0 peak on the third phrase (P3)*

Subjects	P3 in (36a)	P3 in (36b)	Mean diff.	p	Statistically ...
AH	273.9	284.5	10.5	p < 0.07	Not significant
CS	263.2	292.0	28.8	p < 0.0001	Significant
KS	270.4	278.9	8.5	p < 0.07	Not significant
NM	240.2	241.3	1.1	p < 0.88	Not significant
YY	155.9	161.7	5.8	p < 0.22	Not significant

In the next chapter, where the main claim of the thesis will be made, a real case of embedding FIP will be presented. Such a case clearly shows a different pitch contour from that of the multiple *wh*-question. The P-focalized phrase in the embedded FIP is in fact reduced due to the PFR of the embedding FIP. These facts lead us to assume that the multiple *wh*-questions do not involve embedding FIP.

3.3.2   *Mo*-construction

So far, we have examined various kinds of *wh*-question constructions. There is one more syntactic construction that uses a *wh*-phrase. This construction exploits a particle *mo* and a *wh*-phrase to construct a universal quantifier or a negative polarity item (NPI) (Kuroda, 1965; Nishigauchi, 1990; Shimoyama, 2001; Hiraiwa, 2002, among others). Following Shimoyama (2001), we will call this the *Mo*-construction.

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[14]It is unclear at this point why CS's data shows such a robust lowering on the second *wh*-phrase, unlike other speakers.

As we have been seeing in the example sentences (as well as already mentioned in fn. 4), when a *wh*-phrase such as *nani* 'what' or *dare* 'who' is combined with a particle *ka*, the newly created phrase *WH-ka* is an indefinite pronoun, e.g., *nanika* 'something' or *dareka* 'someone'. Besides that, when a *wh*-phrase is combined with a particle *mo*, then the newly created phrase *WH-mo* constitutes a universal quantifier 'everything', 'everyone', etc. or an NPI 'anything', 'anyone', etc..[15]

(39) a. WH+KA = $\exists$

   dáre+ka-ga kíta
   who+KA-NOM came

   'Someone came.'

  b. WH+MO = $\forall$

   dáre+mo-ga kíta
   who+MO-NOM came

   'Everyone came.'

  c. WH+MO ... NEG = $\varnothing$ (*Negative Polarity Item (NPI)*)

   dare+mo-$\varnothing$ kó-**nakat**-ta[16]
   who+MO come-NEG-PAST

   'No one came.'

Interestingly, the *wh*-phrase and the particle *mo* (but not *ka*) can be syntactically remote from each other, as long as the particle *mo* c-commands the *wh*-phrase (Nishigauchi, 1990; Hiraiwa, 2002).[17]

(40) *Universal Quantifier*

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[15]Since Kuroda (1965), *wh*-phrases in Japanese have been called *indeterminate pronouns*, because their meanings cannot be determined by themselves but depend on which particle they are associated with. For expository purposes, however, we call them *wh*-phrases in this thesis.

[16]When *dare-mo* is used as an NPI, the accent on *dáre* disappears. See §3.3.3 for more discussion on this phenomenon.

[17]If *mo* does not c-command any *wh*-phrase, it means 'also'.

a. *DP:* [DP WH NP]-mo

Náoya-ga **dóno**-wáin-**mo** nónda
Naoya-NOM which-wine-MO drank

'Naoya drank every kind of wine.'

b. *DP with a relative clause:* [DP [... WH ...] NP]-mo

[DP [CP **náni**-o   nomíya-de tanónda] sararíiman   ]-**mo** wáin-o   nónda
     what-ACC bar-LOC   ordered   businessman -MO wine-ACC drank

'Every businessman who ordered something at the bar drank wine.'

(41) *NPI*

a. *DP:* [DP WH NP]-mo

Náoya-wa **dóno**-wáin-**mo** nomá-**nakat**-ta
Naoya-TOP which-wine-MO drink-NEG-PAST

'Naoya didn't drink any kind of wine.'

b. *Relative clause:* [DP [... WH ...] NP]-mo

[DP [CP **náni**-o   nomíya-de tanónda] sararíiman   ]-**mo** wáin-o
     what-ACC bar-LOC   ordered   businessman -MO wine-ACC
nomá-**nakat**-ta
drink-NEG-PAST

'No businessman that ordered something at the bar drank wine.'

c. *vP:* [vP ... WH ...]-mo

Mári-wa   [vP **náni**-o   nomíya-de nomi]-**mo** si-**nakat**-ta
Mari-TOP   what-ACC bar-LOC   drink -MO do-NEG-PAST

'For no x, Mari drink x at the bar.'

d. *CP:* [CP ... WH ...]-mo

Náoya-wa [Mári-ga   **náni**-o   nomíya-de nónda to   ]-**mo** iwa-**nakat**-ta
Naoya-TOP   Mari-NOM what-ACC bar-LOC   drank that -MO say-NEG-PAST

'For no x, Naoya said Mari drank x at the bar.'

Just like the *wh*-question, this construction also exhibits the FIP when the *wh*-phrase
and *mo* are apart: *wh*-phrases are P-focalized; and the PFR is observed until *mo*. The pitch

track in (42) shows the existence of the PFR in the embedded clause and the lack of PFR (i.e., a pitch reset) in the matrix clause material after the embedded clause (e.g., *Yumi-ni*).

(42)   Mo-*construction (NPI)*

Náoya-ga   [Mári-ga   **náni**-o   nomíya-de nónda to   ]-**mo** Yúmi-ni
Naoya-NOM   Mari-NOM   what-ACC bar-LOC   drank that -MO Yumi-DAT
iwa-nákat-ta
say-NEG-PAST

'Naoya didn't say to Yumi that Mari drank anything at the bar.'
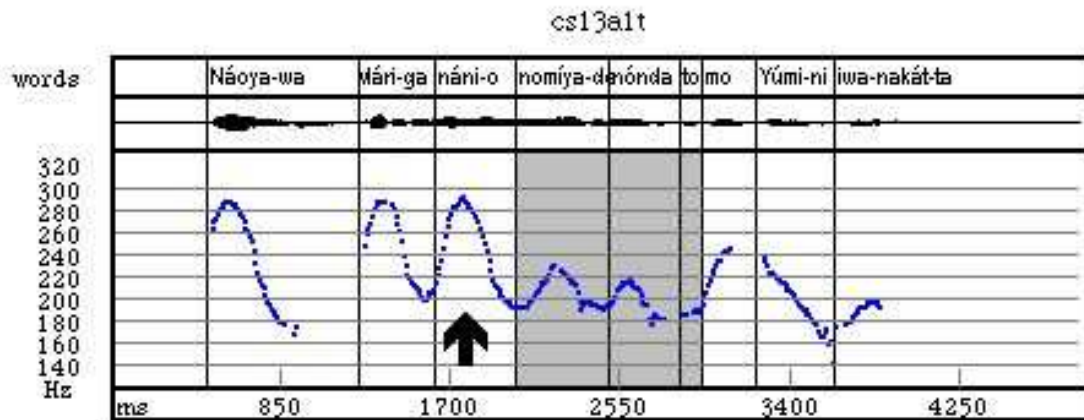
The sharp rising intonation on *mo* seems to be some kind of boundary tone, similar to the rising intonation in the matrix question, which appears at the end of a certain prosodic phrase (see fn. 9). I will assume here that this is a boundary tone assigned to the right edge of a certain prosodic phrase that plays a role as the domain of PFR. This rising intonation may appear on the Complementizer *to* instead of *mo*. These variations can be found interchangeably within a single speaker's utterance, as shown in Figure 3-7.[18]

[18]This peak on *mo/to* given here looks similar to a case of upstep reported by Truckenbrodt (2002) for Southern German. This peak appears to be undoing the downstep and the PFR in the embedded clause. It is also followed by a new phrase which shows a slightly lower peak (which appears to be either downstepped or post-FOCUS-reduced relative to the upstepped peak on *mo/to*), but are still higher than the downstepped/post-FOCUS-reduced phrases in the embedded clause, which Truckenbrodt (2002) claims

(34a): Rising intonation on *mo*
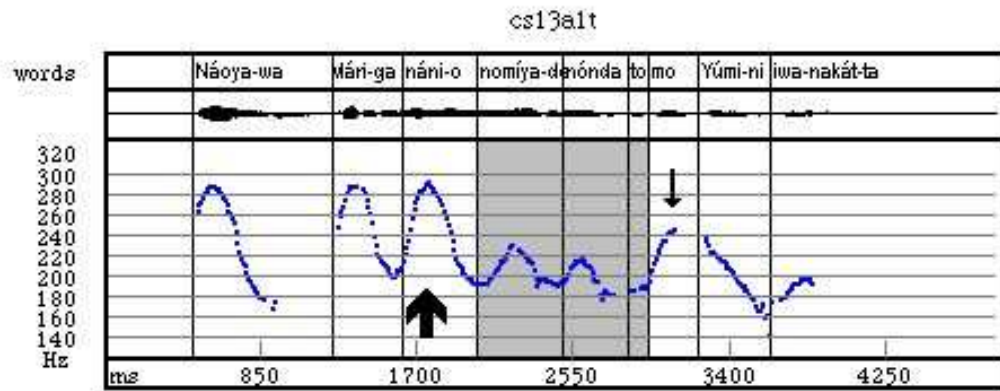
(34a): Rising intonation on *to*

Figure 3-7: Rising intonation on *mo* and *to* (marked with ↓.)

In the case of *Mo*-construction, then, FIP takes place between *wh*-phrase and the particle *mo* that binds the *wh*-phrase, just as FIP takes place between the *wh*-phrase and the Q-particle *ka* or *no* that binds the *wh*-phrase. Researchers have proposed a uniform syntactic/semantic account of the *wh*-question and the *Mo*-construction (e.g., Kuroda, 1965; Nishigauchi, 1990; Shimoyama, 2001). The fact that FIP is observed both between *wh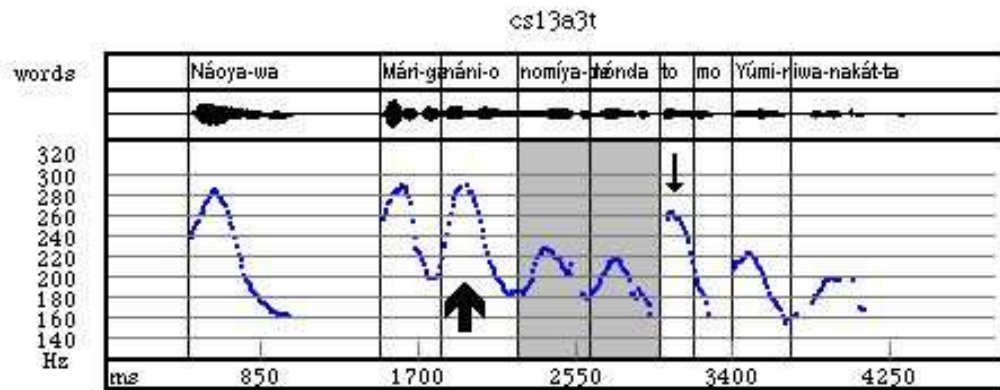*-phrase and the Q-particle *no/ka* and between *wh*-phrase and *mo* provides a further support for our observation that there is a correlation between the domain of FIP and the scope of the WH-Q binding relation.

3.3.3 Excursion: Deaccenting in NPI *Mo*-construction

Although the content of this section does not have a direct influence on the discussion elsewhere, I will document an interesting intonational phenomenon observed in the *Mo*-construction.

As indicated in fn. 16 in (39c), in the NPI use of *Mo*-construction, the lexical accent on the *wh*-phrase (e.g., *náni*, *dáre*, etc.) disappears and becomes an unaccented word. This '*deaccenting*' phenomenon (in the literal sense, i.e., 'elimination of lexical accents') is occasionally observed even when the *wh*-phrase and *mo* are remote. Although it appears this deaccenting intonation pattern is less preferred than FIP (in fact, a much smaller number of utterances of the deaccenting pattern were actually attested in the experiment.[19]), it is an alternative intonation pattern available in the case of NPI use of *Mo*-construction. The following are samples of FIP and deaccenting intonation pattern obtained from a single speaker, as shown in Figure 3-8. (In contrast with the PFR in FIP (marked with ▨▨▨▨), the deaccented material in the deaccenting intonation pattern is indicated with ▨▨▨▨.)

(43) áru   nyúusu-wa [Nómo-ga **dáre**-ni nákkuru-o   nágeta to]-**mo**
      certain news-TOP   Nomo-NOM who-DAT knuckleball-ACC pitched that -MO

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as an instance of 'partial reset' (Ladd, 1988). I will leave for future research the question whether this peak can be treated in the same way.

[19]During the experiment, there were several occasions in which the subject started pronouncing the stimulus sentence with a deaccenting intonation pattern, but corrected the sentence with the FIP.

óokiku hoozi-nákat-ta
widely broadcasted

'One news program did not broadcast widely for any x, x is a person, that Nomo pitched a knuckleball to x.'

In (43b) of Figure 43, not only the accent of *dáre*, but also those of the phrases between *dare* and *mo* also appears absent. Accordingly, all the words between *dare* and *mo* become unaccented (except *to*), and behaves as a single MiP: a phrasal H tone at the second mora (i.e., /re/ of *dare*), and no sharp fall until *to*.

There is a dialect of Japanese in which this deaccenting phenomenon is a default intonation pattern for the *wh*-question. Kubo (1989) reports that in the Fukuoka dialect, a dialect spoken around Fukuoka city of the Kyushu area, *wh*-questions are accompanied with an intonation pattern where all the lexical accent of the phrases between the *wh*-phrase and the end of the sentence, where the Q-particle appears, are deleted.[20,21]

Although the question of whether all the lexical accents are deleted at all or not needs

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[20]A similar phenomena can be observed even in a Tokyo dialect. Among the younger generation, negation question sentences (used to ask for agreement with one's opinion) have this deaccenting property. The deaccenting generally starts from an intensifier such as *tyóo* 'super' or *kánari*.'considerably, quite'.

   i   *Deaccenting in a young generation questions*

       a.   *No deaccenting*

            kono hón, tyóo omosíroku-nai?
            this   book super interesing-NEG

            'Isn't this book super-interesting?'

       b.   *Deaccenting*

            kono hón, tyoo omosiroku-nai?
            this   book super interesing-NEG

            'Isn't this book super-interesting?'

If we assume these intensifiers bear FOCUS, this phenomenon can be analyzed in a parallel way.

[21]Kenstowicz and Sohn (1997) report a similar phenomenon in Northern Kyungsang Korean. When a final accent phrase is followed by another phrase within a single phonological phrase, the contour shows a plateau that starts from the final syllable of the first word.

(43a): FIP between *dare* and *mo*
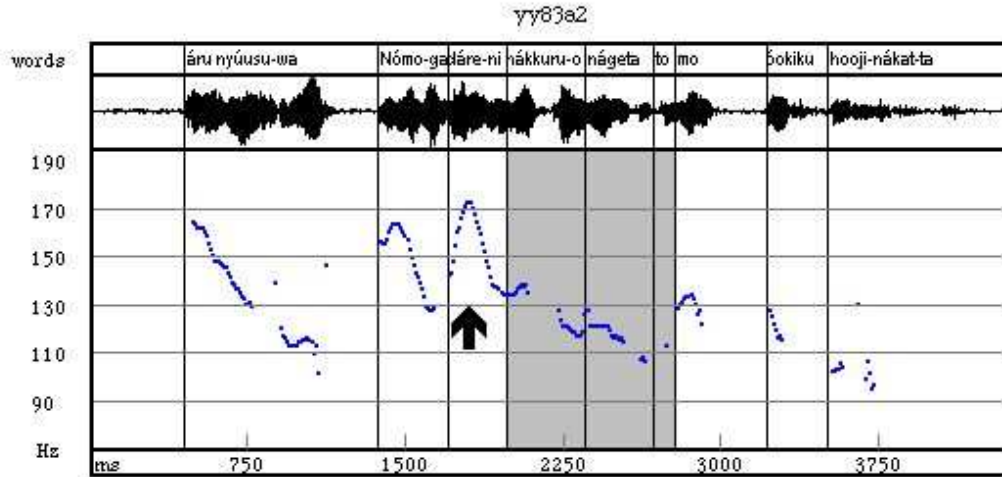
(43b): Deaccenting between *dare* and *mo*
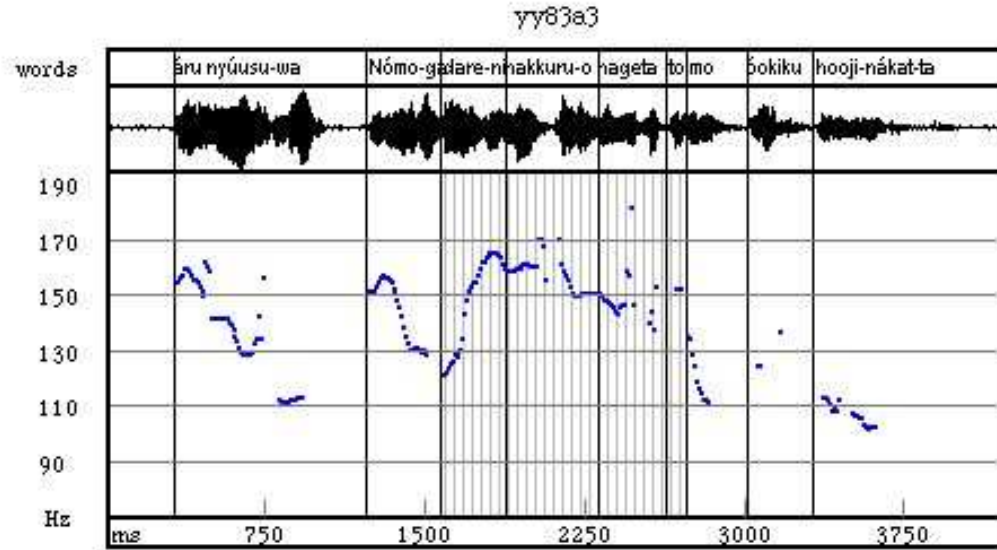
Figure 3-8: FIP (43a) and Deaccenting (43b)

to be examined more closely (because there appears to be a small but recognizable fall after the originally accented syllable of *nákkuru-o* 'knuckleball-ACC'), it is clear that the *Mo*-construction may sometimes create an intonation pattern distinct from the usual FIP. It should be noted, however, the domain of this deaccenting phenomenon is the same as that of FIP: it starts at the *wh*-phrase, and ends at *mo*. I will leave the investigation of the deaccenting intonation pattern for future research.

3.4   Ch. 3: Summary

In this chapter, we examined the intonation of various *wh*-constructions. We have seen that *wh*-constructions exhibit the FIP, and obtained the *FIP–*Wh-*Scope Correspondence* generalization (32), repeated here.

(32)   *FIP–*Wh-*scope Correspondence*
    The domain of FIP corresponds to the scope of *wh*-question.

In the next section, I will propose an account which derives this generalization, as well as explains the phonetic effect of FIP that we discussed in Ch. 2.

Chapter 4

Relative Prominence and Multiple Spell-Out Account of FIP Formation

In Ch. 2, we reviewed prosodic phrasing analyses (Nagahara, 1994; Truckenbrodt, 1995; Selkirk, 2000, 2002, 2003; Sugahara, 2003). These accounts treat FIP as manipulation of prosodic structures by inserting or deleting certain prosodic boundaries. We also saw that in addition to these structural effects of FIP, there are non-structural effects of FIP, which do not affect prosodic phrasing. Sugahara (2003) reported that an F_0-lowering effect is always observed in the post-FOCUS domain, regardless of whether MaP dephrasing is observed or not. Shinya (1999) reports a case in which P-focalization does not create a new MaP boundary. Prosodic phrasing accounts only provide explanations for the structural effects, and do not offer any explanation for these non-structural effects.

In Ch. 3, we discussed the intonation patterns of various *wh*-constructions. We have found that the domain of FIP is sometimes smaller than the whole utterance: the FOCUS-*Wh*-scope Correspondence generalization.

In this chapter, I will propose a model that accounts for the mechanism of FIP formation we have seen so far. First, I will propose a pair of phonological rules that accounts for the non-structural effects of FIP discussed in Ch. 2. Under the *Metrical Grid* representation (Liberman, 1975; Liberman and Prince, 1977), this pair of rules derives the effects of

P-focalization and PFR by first assigning prominence to the FOCUS phrase and then suppressing the prominence of the post-FOCUS material. These rules are only stated in terms of metrical prominence, and make no reference to prosodic phrasing structure. Since the analysis proposed here works independently of prosodic phrasing structure, it naturally derives the non-structural effects of PFR (§2.3.4) and P-focalization (§2.3.5), which the prosodic phrasing analyses we reviewed in Ch. 2 do not provide an account for.

Furthermore, I will claim that the phonological domain in which the FIP is created, i.e., the phonological domain at which P-focalization and PFR take place, is smaller than the whole sentence. More specifically, I claim that the phonological domain for FIP formation corresponds to the syntactic domain of the syntactic operation called *Spell-Out* (Chomsky, 2000, 2001b). This model allows the FIP creation operations (P-focalization and PFR) to apply cyclically during the derivation of a single sentence. (In this sense, this analysis recalls "classic" cyclic rule application analyses such as Bresnan, 1972.) This concept contrasts with those of the models proposed in the earlier literature on FIP, which tacitly assume a non-cyclic output for the realization of FIP. Under a non-cyclic model, focus intonation is created as a part of the phonological representation for the whole sentence. The cyclic model proposed here has some advantages over non-cyclic models. It provides us with natural explanations for certain properties of FIP we saw in Ch. 3, namely, (1) that the PFR does not always continue until the end of the sentence; (2) that there is a prosody-semantics correspondence between the PFR domain and the scope of focus.

Under the cyclic model, we predict that the cyclic applications of FIP formation rules could create an FIP embedded in another FIP. If such intonation is in fact attested, it is a crucial property of FIP that would pose a big challenge to non-cyclic accounts. Non-cyclic models, especially those formalized in accordance with the Strict Layer Hypothesis (Nespor and Vogel, 1986; Selkirk, 1984), would not expect embedding of one FIP into another. In order to test the cyclic model of FIP formation proposed here, an experiment was conducted, the results of which will be presented in the next chapter (Ch. 5).

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4.1 Relative Prominence Analysis

In Ch. 2, we saw that there are non-structural effects of FIP that do not affect prosodic phrasing. The earlier accounts we reviewed in Ch. 2 all deal with these structural effects of FIP and do not offer accounts of the non-structural effects. Since FIP consistently exhibits these effects, there must be some phonological mechanism that derives them. In this section, I will propose a pair of phonological rules which derive these effects.

4.1.1 P-focalization Rule and PFR Rule

Let us start the discussion with a sentence that lacks FOCUS. Recall that if a sentence does not contain any FOCUS, its pitch contour is created according to the Syntax-Prosody Mapping (4) (§2.1.4), repeated here.

(4) *Syntax-Prosody Mapping (Selkirk and Tateishi, 1991)*

The left edge of an XP must coincide with the left edge of a Major Phrase.

For example, sentence (7a) of Ch. 2, repeated below, which does not contain any FOCUS phrase, has three MaPs, whose left edges correspond to the left edges of the maximal projections, TP, and two VPs.

(7a) [$_{\text{TP}}$ Aóyama-ga [$_{\text{VP}}$ aníyome-ni [$_{\text{VP}}$ erímaki-o ánda]]]
    Aoyama-NOM   sister-in-law-DAT   scarf-ACC knitted

'Aoyama knitted a scarf for his sister-in-law.'

79
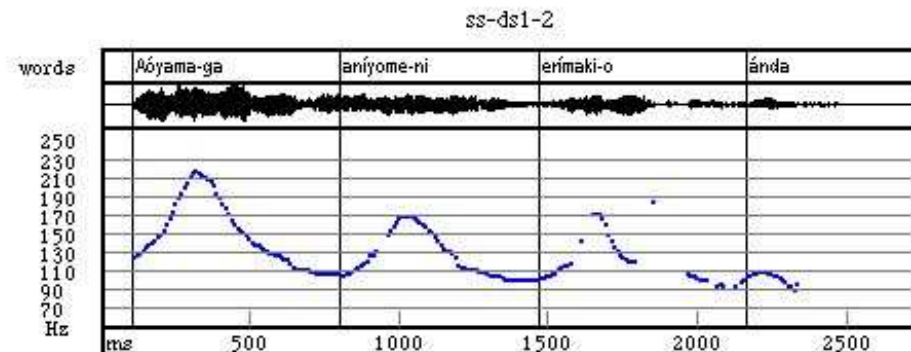
When some phrase in this sentence bears FOCUS, e.g., the indirect object *aniyome-ni* 'sister-in-law-DAT' in (7b), the F_0 realization of the sentence is different.

(7b) [$_{TP}$ Aóyama-ga   [$_{VP}$ aníyome**FOC**-ni   [$_{VP}$ erímaki-o ánda   ]]]
      Aoyama-NOM   sister-in-law-DAT   scarf-ACC knitted

'Aoyama knitted a scarf for his sister-in-law$_{FOC}$.'
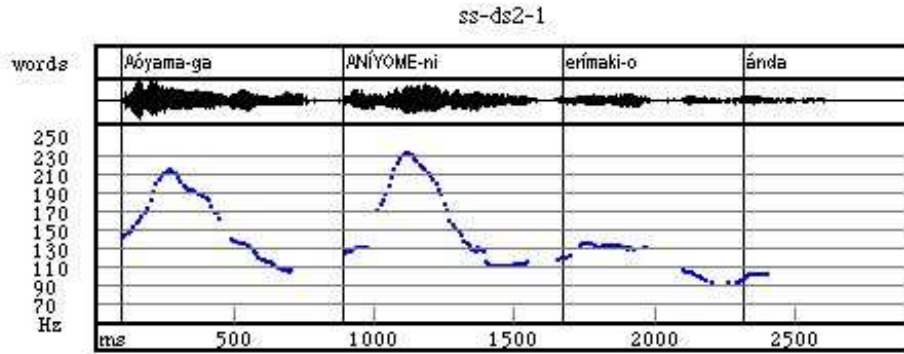
As we have already seen, the FIP is characterized by the P-focalization and the PFR. Hence the basic facts to be captured are F_0-boosting on the FOCUS phrase (P-focalization) and F_0-lowering on the post-FOCUS material (PFR). In order to implement this idea, I will propose two phonological rules that assume a *Metrical Grid* representation (Liberman, 1975; Liberman and Prince, 1977).

Suppose we have a sequence of three accented Prosodic Words [α β γ]. Line 0 represents numbers of mora in each PWd. The pitch accent of each PWd adds an $\times$ to Line 1.

(44)   Line 1 | $\times$ $\times$ $\times$
       Line 0 | ($\times$ $\times$ $\times$) ($\times$ $\times$ $\times$) ($\times$ $\times$ $\times$)
              | α β γ

Now suppose that β bears FOCUS. The grid representation will be modified to realize the FIP. P-focalization can be interpreted as a phonological operation that assigns the highest prominence to the FOCUS phrase. It may be stated as the rule given below:

(45)   *P-focalization Rule*

       If α_{FOC} bears FOCUS, Add $\times$'s to α_{FOC} until a new line is formed.

The FOCUS on β_{FOC} in (44), then, will add an $\times$ to β_{FOC} and projects a new line, Line 2.

(46)   *P-focalization—Adding $\times$'s*

$$
\begin{array}{l|ccccccccc}
\text{Line 2} & & & & & \times & & & & \\
\text{Line 1} & & \times & & & \times & & & \times & \\
\text{Line 0} & (\times & \times & \times) & (\times & \times & \times) & (\times & \times & \times) \\
& & \alpha & & & \beta_{\text{FOC}} & & & \gamma &
\end{array}
$$

Post-FOCUS reduction, on the other hand, is an $\times$-deletion operation that is phonetically realized as an F_0-lowering phenomenon.

(47)   *Post-FOCUS Reduction (PFR) Rule*

If α_{FOC} bears FOCUS and precedes β, and α_{FOC}'s peak (after P-focalization) is at Line n, then delete an $\times$ of β on Line $n - 1$.

The application of the PFR Rule to (46) deletes an $\times$ of γ on Line 1. The reason this operation targets a specific grid line (Line $n - 1$, that is Line 1 in this case) will be made clear later in this chapter (See §4.3.1). For the time being, it is sufficient to interpret this rule as $\times$-deletion rule. As a result of the PFR Rule, the following grid is created. (Deleted grid marks are shown in square brackets, $[\times]$.)

(48)   *Post-FOCUS reduction—Deleting an $\times$*

$$
\begin{array}{l|ccccccccc}
\text{Line 2} & & & & & \times & & & & \\
\text{Line 1} & & \times & & & \times & & & [\times] & \\
\text{Line 0} & (\times & \times & \times) & (\times & \times & \times) & (\times & \times & \times) \\
& & \alpha & & & \beta_{\text{FOC}} & & & \gamma &
\end{array}
$$

We encounter a problem here. Deletion of $\times$ of Line 1 on γ means deletion of pitch accent. According to Sugahara (2003), however, the PFR does not delete pitch accent (see fn. 19 in §2.3.4). Since pitch accents are observed even in the PFR domain, grid marks on Line 1, which represent pitch accents, should not be eliminated. If so, there is no grid line at which a grid mark deletion operation (i.e., PFR) can apply in (48). Here I will assume that there is one more line (Line 2) above pitch accent by default. Accordingly, if there is no FOCUS in the sentence, each phrase projects lines up to Line 2.

(49) *Default grid (Expression without FOCUS)*

Line 2		×			×			×	
Line 1		×			×			×	
Line 0	(×	×	×)	(×	×	×)	(×	×	×)
		α			β_{FOC}			γ	

Given this grid, the P-focalization adds a grid mark on the FOCUS phrase β_{FOC}, projecting Line 3, while the PFR deletes a grid mark on Line 2 of the post-FOCUS phrase γ. The result appropriately represents the expected FIP.

(50) *FIP—Adding × on β_{FOC}, deleting × on γ*

Line 3					×				
Line 2		×			×			[×]	
Line 1		×			×			×	
Line 0	(×	×	×)	(×	×	×)	(×	×	×)
		α			β_{FOC}			γ	

The FIP formation process illustrated here does not involve prosodic phrase manipulation (i.e., boundary insertion or dephrasing). It works independently of prosodic phrasing structure. The pitch contour is created as phonetic realization of the prominence relations represented in the metrical grid. As Sugahara (2003) pointed out, post-FOCUS material is realized lower regardless of the existence/absence of the structural effect. This analysis can capture this non-structural effect of PFR straightforwardly. The PFR is a realization of the grid mark deletion operation, which produces a prominence contrast between the post-FOCUS material and the FOCUS phrase.

4.1.2   Downstep and P-focalization

Let us consider the non-structural effect of P-focalization reported by Shinya (1999). He found that a FOCUS phase exhibits not only the F_0-boosting phenomenon due to P-focalization, but also the downstep effect. This fact can also be captured under our analysis. Consider a case like (51), where there are two genitive phrases (α, β), and a phrase head (γ).

(51)   [$_{\text{DP}}$ [$_{\text{DP}}$ [$_{\text{DP}}$ α-GEN] β-GEN] γ]

This phrase is mapped onto a phonological representation as a single MaP, following the Syntax-Prosody Mapping (4). β and γ are expected to show downstep, because they are not MaP-initial phrases. Accordingly, (51) would be realized in a pitch contour as in (52), where β and γ exhibit downstep.

(52)   *Predicted pitch contour for (51)*
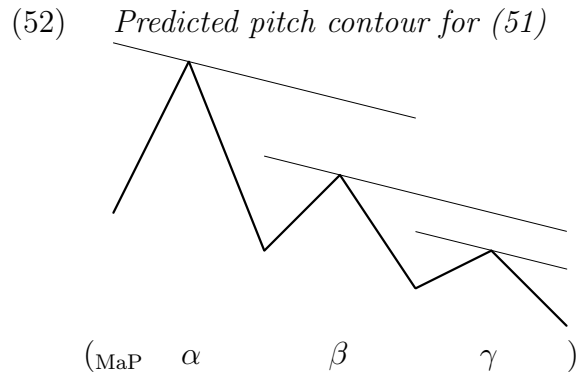
The F_0 peak of α is realized in full pitch range, because it is the MaP-initial phrase. β is subject to downstep, and is hence realized in a smaller pitch range than α. Similarly, γ is also subject to downstep, realized in a yet smaller pitch range than β. (Lines on top of each F_0 peak represent the pitch register.)

At this point, we need to consider how downstep interacts with the metrical grid. Downstep is a phonological process induced by H*L pitch accent (Pierrehumbert and Beckman, 1988). The mechanism of downstep, however, appears to be completely independent of the metrical grid representation, for a number of reasons.

First, downstep is a pitch-register compression operation, rather than a prominence reduction operation. That is, it compresses the range of pitch realization of a relevant domain (i.e., within MaP after a H*L pitch accent), maintaining the relative prominence of the phrases within this domain. It is not an operation that directly manipulates each prominence. (A downstepped H tone or H*L tone does not change its status to Mid tone or L tone due to downstep.) Also, downstep is *cumulative.* If downstep is viewed as a grid mark-reduction operation, it would iteratively delete grid marks of the same grid column, which cannot be the case. Certain prominences represented by the grid marks, e.g., pitch accents, are not eliminated by downstep. (See also relevant discussion in §4.3.1 and §5.5) Given all

these factors, I will assume that the effect of downstep is independent of the metrical grid, and hence is not realized in the grid representation.

If this is the right interpretation of downstep, then, α, β, and γ in (51) are all represented with the same default height, projecting up to Line 2.

(53)   *Metrical grid representation for (51)*

```
Line 2 |    ×             ×             ×
Line 1 |    ×             ×             ×
Line 0 | (×   ×   ×)   (×   ×   ×)   (×   ×   ×)
             α             β             γ
```

Now consider a case in which γ bears FOCUS.

(54) $[_{DP}\ [_{DP}\ [_{DP}\ \alpha\text{-GEN}\ ]\ \beta\text{-GEN}\ ]\ \gamma_{FOC}\ ]$

The FIP rules (P-focalization/PFR) will be applied to (54). In this case, however, the PFR does not apply, since there is no element on the right of the FOCUS phrase. Accordingly, only P-focalization applies. An × will be added to γ, projecting Line 3.

(55)   *P-focalization on γ*

```
Line 3 |                                ×
Line 2 |    ×             ×             ×
Line 1 |    ×             ×             ×
Line 0 | (×   ×   ×)   (×   ×   ×)   (×   ×   ×)
             α             β            γ FOC
```

In the phonological representation, γ bears the highest prominence. This prominence will be realized as an F_0-boosting effect. Together with downstep (whose effect is not represented in the grid representation), the actual output will be something like (56):

(56)   *Predicted pitch contour (solid line)*

$$(_{\text{MaP}} \quad \alpha \qquad\quad \beta \qquad\quad \gamma_{\text{FOC}} \quad)$$
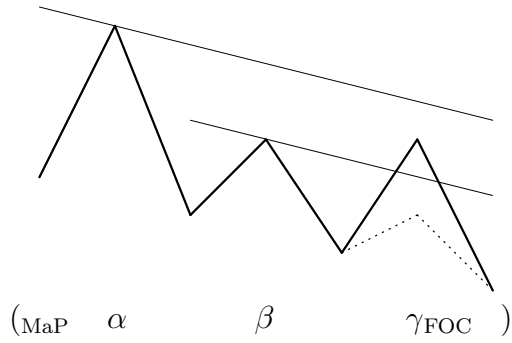
P-focalization, which is phonologically represented by an addition of a grid mark, is phonetically realized as an F_0-boosting effect. This F_0-boosting is not necessarily involved in an insertion of a MaP boundary. If P-focalization is a MaP boundary insertion operation, we *always* expect a full pitch reset. The output on γ, however, is analyzed here as a combination of the F_0-boosting effect by P-focalization and the F_0-lowering effect by downstep. It does not necessarily exhibit a full pitch reset.

Note that the boosting effect *may* suppress downstep completely. The prominence relation would be appropriately realized even if the effect of P-focalization completely counterbalances the downstep effect. In order to better understand the interaction between downstep and P-focalization, the actual amount of the F_0-lowering effect by downstep and that of the F_0-boosting effect by P-focalization would have to be examined closely. We will not address this question any further in this thesis. The point is that our analysis does not predict that P-focalization always inserts a MaP boundary and hence cancels the downstep effect.

Recall that there has been a debate about the existence of the downstep effect on a FOCUS phase in a downstepping environment, discussed above in §2.3.5. Poser (1984) claimed that there is downstep effect on the FOCUS phrase, while Pierrehumbert and Beckman (1988) claimed that there is no downstep effect. The difference between their observations could be due to variation in the realization of the P-focalization effect.

Suppose, for example, that β bears FOCUS in (51). P-focalization takes place on β, and the PFR takes place on γ. At the same time, β and γ are subject to downstep as well.

(57) $[_{\text{DP}} [_{\text{DP}} [_{\text{DP}} \alpha\text{-GEN}] \beta_{\text{FOC}}\text{-GEN}] \gamma]$

The grid representation would be as follows:

(58)   *P-focalization on β; PFR on γ*

```
Line 3 |                       ×
Line 2 |         ×             ×                  [×]
Line 1 |         ×             ×                   ×
Line 0 | (×   ×   ×)   (×   ×   ×)   (×   ×   ×)
        |         α             β FOC             γ
```

The F_0 of β_{FOC} is raised due to P-focalization. This F_0-boosting effect may completely mask the effect of downstep, but not necessarily. As a result, the pitch contour may look like (59a) or (59b).[1]

(59)   *Predicted pitch contour (solid line)*

a.   *Downstep completely suppressed*   b.   *Downstep not completely suppressed*
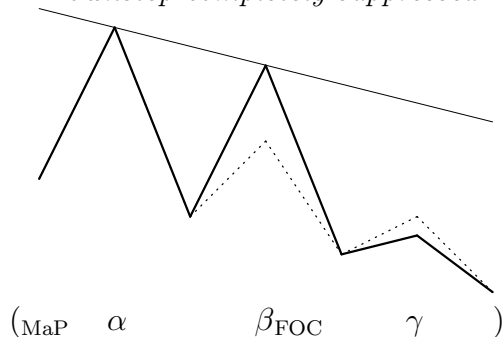
$(\text{MaP} \quad \alpha \qquad \beta_{FOC} \qquad \gamma \qquad)$ $(\text{MaP} \quad \alpha \qquad \beta_{FOC} \qquad \gamma \qquad)$
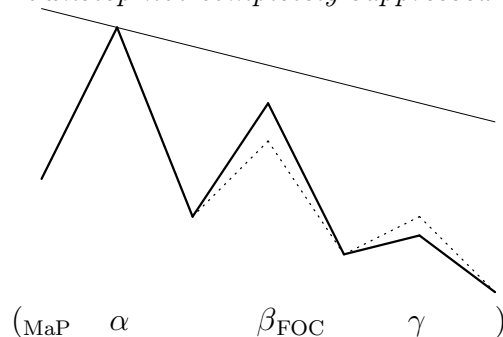
As Shinya (1999) pointed out, the second phrase in a MaP (i.e., β) has undergone down-step only once. Therefore, it could be the case that the downstep effect is completely counterbalanced by the P-focalization effect. This does not necessarily indicate the existence of MaP insertion, as pointed out by Poser (1984) and Shinya (1999).

In sum, I proposed that P-focalization and PFR are realizations of the prominence contrasts created by the two rules. The P-focalization Rule adds ×'s to make the FOCUS phrase the most prominent. The PFR Rule reduces the prominence of post-FOCUS material. This model works independently of prosodic phrasing, and hence naturally derives the non-structural effects of FIP.

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[1]It may also be the case that the effect of PFR might be absent on γ, because downstepped γ might have already reached its lowest register and may not be lowered any further.

Before closing this section, it is worth noting that the idea implemented by the P-focalization Rule proposed here is similar to the one proposed in the IP-Prominence Theory (§2.3.2) in that the P-focalization Rule assigns some kind of prominence to the FOCUS phrase, just as the FOCUS-Prominence constraint (14) in the IP-Prominence Theory requires an IP prominence on a FOCUS phrase (§2.3.2). It however differs in that the type of prominence is not specified as IP prominence. This difference becomes crucial in the next section.

4.2   Multiple Spell-Out Account of FIP formation

In the previous section, I proposed two FIP formation rules, namely, the P-focalization Rule (45) and the PFR Rule (47), which produce the P-focalization and the PFR as realizations of prominence relations assigned to FOCUS phrases and post-FOCUS phrases. The remainder of this chapter concerns the timing of the these rules and the domains to which they apply.

4.2.1   Properties of FIP That Need to be Explained

There are two properties of FIP that need to be explained. The first is the pitch contour of indirect *wh*-questions. The other is the FIP-*Wh*-Scope Correspondence we saw in the previous chapter.

FIP of the indirect *wh*-question

As we saw in (30b) in the previous chapter, indirect *wh*-questions exhibit an FIP only within an embedded clause. The PFR stops at the end of embedded clause, where the Q-particle *ka* appears. This means that there is a pitch register reset after the embedded clause.

(30b)   Náoya-wa [Mári-ga **náni**-o   nomíya-de nónda **ka**] ímademo obóeteru
       Naoya-TOP   Mari-NOM what-ACC bar-LOC   drank Q   even.now remember
       'Naoya still remembers what$_i$ Mari drank t_i at the bar.'

ah11a1t
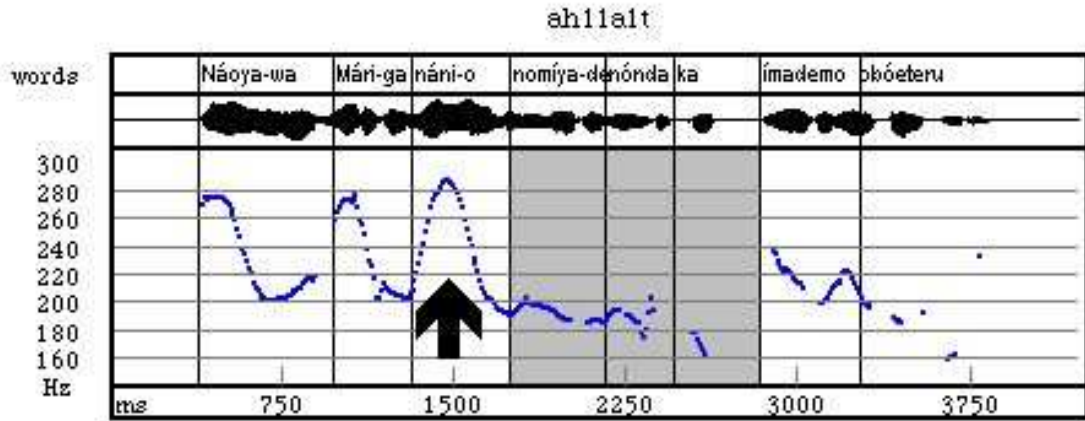
If we apply the FIP Rules to the whole sentence of (30b), we would not be able to derive a correct intonation pattern.[2]

(60)

	Line 3				×					
	Line 2	×		×		×		[×]	[×]	[×]	[×]
	Line 1	×		×		×		×	×	×	×
		Náoya	[	Mári		**náni**FOC		nomíya	nónda ka]	ímademo	obóeteru
		Naoya		Mari		what		bar	drank Q	even.now	remember

The P-focalization Rule assigns an × on the *wh*-phrase *nani-o* 'what-ACC' on Line 3. The PFR Rule deletes ×'s on Line 2 of all the post-FOCUS phrases, including *imademo* 'even.now', which belongs to the matrix clause and exhibits the pitch reset. Given that *imademo* exhibits a pitch reset as shown above, the × on Line 2 of this phrase should not be deleted. In other words, the PFR Rule should not apply to the matrix material.

The question that arises here is how the phonology knows when the PFR ends. We observed in the previous chapter that the PFR always stops at the Q-particle that marks the scope of the *wh*-phrase. Considering the phonological operations such as PFR, however, we cannot simply say that the PF component terminates the PFR whenever it finds the particle that semantically binds *wh*-phrases. For one thing, the particles do not constitute a Prosodic Word by themselves. Nor do they bear any pitch accent by themselves. At the

---

[2]In the metrical grids hereafter, Line 0 will omitted without notice.

matrix clause, they may be even phonologically null (Yoshida and Yoshida, 1996). It is thus unlikely that they behave as a phonological cue that the phonological system can recognize. For another, the mere existence of a Q-marker cannot be a cue. As we saw in (34b) in the previous chapter, repeated here, the PFR may proceed past a Q-marker.

(34b) *PFR past Q-marker*

Náoya-wa [Mári-ga **náni**-o nomíya-de nónda **ka**] ímademo obóeteru **no**?
Naoya-TOP Mari-NOM what-ACC bar-LOC drank Q even.now remember Q

† 'What$_i$ does Naoya still remember whether Mari drank t_i at the bar?
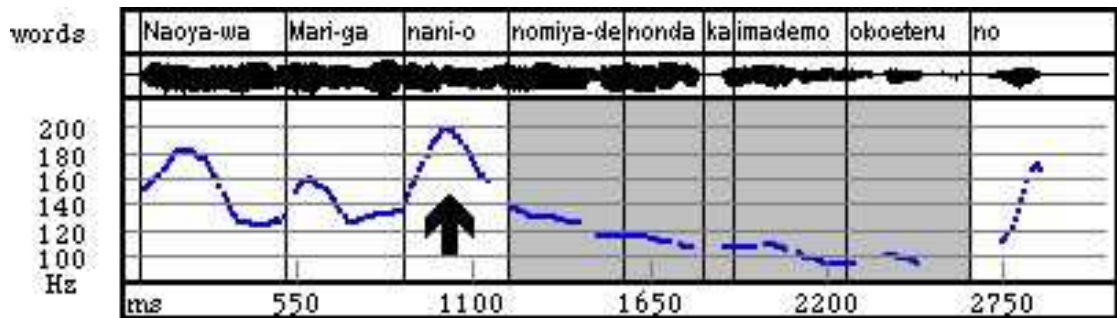
The PFR only stops at a Q-marker when this Q-marker marks the scope of the *wh*-phrase. If an analysis needs to specify the end point of the PFR, it would have to assume that the phonological PFR operation is sensitive to the semantic function of the Q-particle.

FIP-*Wh*-Scope Correspondence

As we saw in the previous chapter, there is a correspondence between the PFR domain and the *wh*-scope (FIP-*Wh*-Scope Correspondence in (32)). Under a standard hypothesis within Generative Grammar, the syntactic derivations feed two interface levels, PF and LF, but there is no direct interaction between the two interface levels. If this model is correct, the phonological component does not interpret semantic information directly.

Let us see how these properties are explained in the analysis proposed in this thesis.

4.2.2 Multiple Spell-Out

In order to explain the properties of FIP described above, I will adopt the hypothesis of *Multiple Spell-Out* in the recent Minimalist framework proposed by Chomsky (2000, 2001b).

Spell-Out is a syntactic operation which sends the syntactic derivation to the two interface levels, PF and LF. In the earlier stages of the Minimalist Program (Chomsky, 1995), it was assumed that Spell-Out takes place only once in each syntactic derivation. The organization of the grammar maintains the shape of the "Y-model" in the Government-and-Binding (GB) framework (Chomsky, 1981).

(61)   *Single Spell-Out* (Chomsky, 1995)

```
            |
            |
            •  Spell-Out
           ╱ ╲
          ╱   ╲
        PF      LF
```
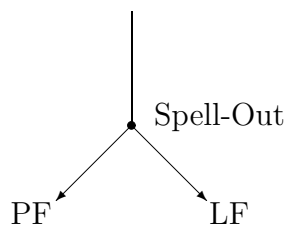
In more recent work, Chomsky (2000, 2001a,b) claims that Spell-Out takes place more than once during a single derivation.

(62)   *Multiple Spell-Out* (Chomsky, 2000, 2001b,a)

```
            |
            •  Spell-Out
           ╱ ╲
         PF    LF
            •  Spell-Out
           ╱ ╲
         PF    LF
            •  Spell-Out
           ╱ ╲
         PF    LF
```
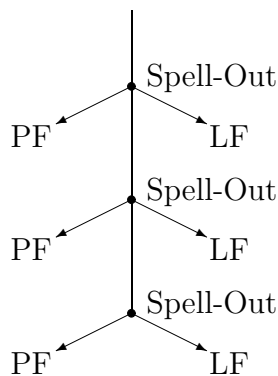
The size of the Spell-Out domain is a matter of debate. Chomsky (2000, 2001b), for example, claims that the Spell-Out applies to the complement of two functional projections, vP and CP (i.e., VP and TP, respectively). (See also Uriagereka, 1999; Nissembaum, 2001,

among others, for relevant discussion.) In this thesis, I assume that Spell-Out applies to vPs, and CPs (rather than the complement of them, unlike Chomsky's 2000; 2001b original claim). This analysis is similar to that of Fox and Pesetsky's (2003), who propose that linear order precedence relations are evaluated at each Spell-Out domain, vP and CP in their framework.[3]

The idea of Multiple Spell-Out is introduced by Chomsky (2000) for the sake of "computation efficiency." The larger the syntactic structure that the computational system C_{HL} deals with at one time, the more burden memory is taxed. By sending off to the interface levels the subparts of the syntactic derivation in which all the syntactic computation (e.g., checking of uninterpretable features) is complete, the computational complexity can be reduced. The basic motto of Multiple Spell-Out is "send any syntactic dependencies to the interface levels as soon as they are resolved."

4.2.3   Multiple Spell-Out and PF/LF Interface

My proposal is that the phonological information of FIP (and possibly other information of suprasegmental phonology as well) is processed in PF at certain Spell-Out cycles, instead of being computed after the whole sentence is constructed. This means FIP creation process takes place in the course of derivation, rather than after all the sentence structure is build. I propose that the FIP Rules proposed in §4.1.1 above apply to certain Spell-Out domains during the course of derivation. More specifically, they apply at the Spell-Out cycle at which the FOCUS feature is assigned to the FOCUS phrase by the relevant Complementizer head.

As we have seen in the case of indirect *wh*-questions (30b), the Spell-Out domain to which the FIP Rules apply may be smaller than the utterance (Utt). Furthermore, it corresponds to the semantic scope of *wh*-questions, as we have seen in the previous chapter. By incorporating the notion of Multiple Spell-Out, we can provide a natural explanation for this.

---

[3]The basic concept of the two analyses are also quite similar. Fox and Pesetsky (2003) propose that precedence relations are established at each Spell-Out domain. In the analysis to be proposed below, the pitch prominence relations are established at each Spell-Out domain.

We have already seen that in Japanese, both sentences containing FOCUS and *wh*-questions exhibit FIP. We have tacitly assumed that this property is due to the FOCUS feature that is assigned to both FOCUS phrases and *wh*-phrases. Strictly speaking, however, the semantics of focus and the semantics of *wh*-questions are different.

First, the discourse functions of focus and *wh*-questions are different. Focus creates a set of alternatives, while *wh*-questions are asking for some information. The mechanisms underlying the two constructions are also not exactly the same. In the semantics of focus (Rooth, 1985, 1992, 1995), a FOCUS feature induces the generation of a *focus semantic value* in addition to the ordinary semantic value. The focus semantic value is a set of alternatives from which the ordinary value of the sentence is drawn. In the semantics of focus, the existence of the FOCUS feature is explicitly assumed. This is not the case in the semantics of *wh*-questions. For Hamblin (1973), a *wh*-phrase denotes a set of individuals by itself (in the ordinary semantics, in Rooth's sense), and does not call for the additional focus semantic value.

It is, however, also true that focused elements and *wh*-phrases are similar semantic objects: they both create a set of alternatives. They both serve as the source of the alternative set. Considering the similarity of focused phrases and *wh*-phrases in terms of phonology, as well as the similarity between the two in terms of the semantics, it may be plausible to consider that what we have been calling the FOCUS feature in this thesis is a phonological property of alternative-inducing elements in general, not just of focus. We do not pursue this question any further, but simply assume that what we have been calling FOCUS feature is a phonological feature which FOCUS phrases and *wh*-phrases share in common.

I also assume that the semantics of focus is computed at the syntactic node where the focus semantic operator ($\sim$) is introduced, which I assume to be Foc head under Rizzi's (1997) articulated CP system. Similarly, the semantics of *wh*-question is computed at the syntactic node where the Q-particle *ka/no* is introduced (the FORCE phrase, which appears higher than the Foc phrase in Rizzi's model.) In the case of the *Mo*-construction (§3.3.2), the particle *mo* behaves as a FOCUS-sensitive Complementizer that can attach to DPs, VPs

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(or vPs), or CPs. For simplicity, we will treat all these functional heads as Complementizer.
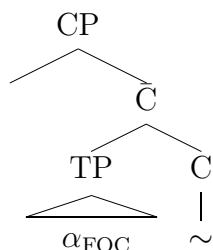
(63)   *focus sentence*   Wh-*questions*   Mo-*construction*

```
        CP                    CP                    CP
       /  \                  /  \                  /  \
          C̄                     C̄                     C
        /   \                 /   \                 /   \
      TP     C             TP     C         DP/vP/CP     C
      /\     |             /\     |            /\        |
   αFOC      ∼            wh    ka/no         wh        mo
```
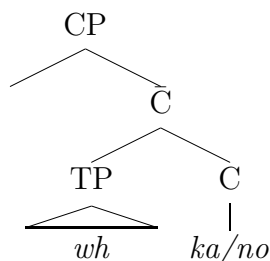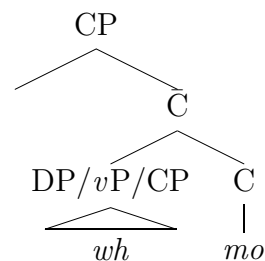
At the point in the derivation when this CP level is created, the semantic computation of focus/*wh*-question is completed. Given the nature of Spell-Out, it is natural to consider that the semantic information of this focus or *wh*-question is sent to LF at this CP Spell-Out cycle.

It is then also natural to consider that the phonological information of FIP is also sent to PF at the same Spell-Out cycle at which the semantic information of focus/*wh*-question is sent off to LF. I will argue that the Spell-Out cycle at which the semantics of focus/*wh*-question is computed is the same Spell-Out cycle at which the phonology of focus/*wh*-question is computed. If this is the case, we can explain the two properties mentioned in §4.2.1, namely, the FIP in the indirect *wh*-questions and the FIP-*Wh*-Scope Correspondence.

If FIP Rules apply at the relevant Spell-Out cycle, they only apply to the material within this Spell-Out domain. Within a Spell-Out domain, the prominence relation between the FOCUS phrase and the post-FOCUS phrases is created by the P-focalization of the FOCUS phrase and by the PFR of the post-FOCUS material. Any material that is outside the Spell-Out domain (i.e., the material that is sent to PF at the later Spell-Out cycle) is not affected by the application of the rules at this cycle. The FIP in indirect *wh*-question is one such case. We will see that in the case of indirect *wh*-questions, the FIP Rules apply at the embedded CP cycle and hence do not affect the F_0 of the matrix material. Also, the FIP-*Wh*-Scope Correspondence will be explained as a result of the timing at which the semantics and the phonology of focus/*wh*-question are computed at each interface level.

4.2.4 Mechanism

In order to implement the idea sketched above, I will propose the following mechanism.

FOCUS-assignment by C

First, I assume that the FOCUS phrases/*wh*-phrases are first introduced to the derivation *without* the FOCUS feature. FOCUS features are assigned to these phrases during the course of syntactic derivation by the relevant Complementizers (Foc head for focus, Q-particle (i.e., Force head) for *wh*-question, *mo* for *Mo*-construction). These Complementizers assigns FOCUS features to phrases in its c-commanding domain. This FOCUS-assignment operation takes place when the relevant Complementizer is introduced to the syntactic derivation. If a *wh*-phrase or a phrase to be focused is not assigned a FOCUS throughout the derivation, the derivation will not obtain the intended interpretation.

(64)   *FOCUS-assignment by C*
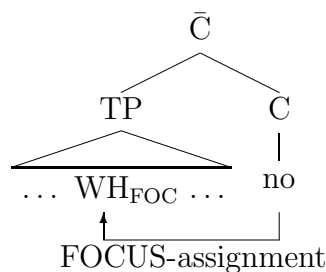
This feature-assignment mechanism seems to be of different type from Agree operation proposed in the Minimalist framework. Q-particles can assign a FOCUS feature to a phrase via long-distance dependency relation, which is not allowed for the Agree operation. Also, FOCUS-assignment does not obey minimality. We have seen in (34) in Ch. 3 that Japanese *wh*-question allows a WH-Q dependency crossing another Q-particle (with some difficulty for some speakers).

Timing of FIP Rule application

Second, if a syntactic derivation contains a FOCUS feature when it undergoes Spell-Out, the FIP Rules apply to this Spell-Out domain at this Spell-Out cycle. If a derivation contains no FOCUS feature, the rules do not apply. This means that the FIP Rules do not apply at any early Spell-Out cycles until the FOCUS phrase/*wh*-phrase is assigned a FOCUS feature. Until then, these phrases are treated exactly the same way as other non-FOCUS phrases.

(65) *FIP Rule Application*

The FIP Rules apply to a Spell-Out domain if it contains a FOCUS.

For a Q-particle in a Yes/No-question, I assume that it does not assign a FOCUS feature to any phrase (although Foc head in the sentence may assign FOCUS to some phrase independently). Alternatively, it seems plausible to assume that Q-particle in Yes/No-question assigns FOCUS to the verbal head V. Recall that the Syntax-Prosody Mapping (4) states that the left of an XP be aligned with a left edge of MaP. Verbal heads, which are not aligned to a left edge of an XP, should not be aligned with a MaP boundary if it follows the Syntax-Prosody Mapping. Hence, they are expected to exhibit downstep. In Yes/No-questions, however, they sometimes seem to lack the downstep effect. I will leave close investigation on this question for future research. The point here is that the Q-particle in a Yes/No-question does not assign FOCUS to a *wh*-phrase even if there is one in its c-commanding domain.

Feature deletion

I will assume that after the FIP Rules applied to a FOCUS feature at one Spell-Out cycle, the feature is deleted. Consequently, they become invisible to operations at later Spell-Out cycles. This essentially means that once the FIP Rules apply to a particular FOCUS feature, this feature will never trigger the application of the FIP Rules at any later Spell-Out cycle.

(66) *FOCUS deletion*

Once the FIP Rules apply to a FOCUS feature, it is deleted. Deleted FOCUS features will not be visible at the later Spell-Out cycle.

4.2.5   Example 1: Indirect *Wh*-question

Let us consider how the proposed system works with actual examples. We start with the case of indirect *wh*-questions, where the PFR ends at the end of the embedded clause. We would like to derive the final output schematically described in (67). (In the schematic representations below, P-focalization is indicated by $\boxed{\text{box}}$, and the PFR is indicated by underline.) P-focalization takes place on the *wh*-phrase, and the PFR applies to the material after the *wh*-phrase (i.e., β), but not to the material in the matrix clause (γ).

(67)   *Final Output*

$[_{CP} \dots \alpha \dots [_{CP} \dots \boxed{\text{WH}} \underline{\dots \beta \dots} \text{Q}] \dots \gamma \dots]$

Let us start with the embedded vP. This is the first Spell-Out cycle of the syntactic derivation. Let us suppose that WH is contained in this vP, as shown in (68).

(68)   *vP Spell-Out cycle*
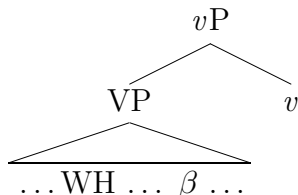
At this point, the Q-particle is not introduced to the derivation. The FOCUS feature is not yet assigned to WH at this Spell-Out cycle. Therefore, the FIP Rule do not apply to this Spell-Out domain. (In the discussion below, I will omit the consideration of vPs unless noted, since it rarely plays a crucial role in the current discussion.)

When the derivation reaches to the embedded CP, the Q-particle is introduced to the derivation. This Q-particle assigns a FOCUS feature to WH. The WH now bears FOCUS.

(69)   *Step I: Embedded CP*

$[_{CP} \dots \mathbf{WH}_{\text{FOC}} \dots \beta \dots \mathbf{Q}]$
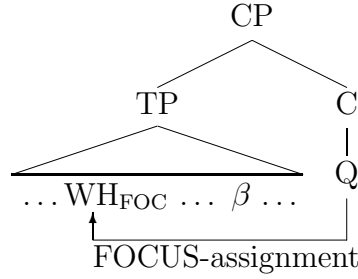
At this Spell-Out cycle, the derivation contains a FOCUS feature. Therefore, the FIP Rules apply at the PF component. (At the same Spell-Out cycle, the semantics of the *wh*-question is computed at the LF component, which we do not delve into any further.) The grid representation for this Spell-Out domain is as follows. The P-focalization Rule adds an ×'s to WH until the line surpasses all others (in this case, up to Line 3), while the PFR Rule deletes an × of β on Line 2.

(70)   *Grid for (69)*

$$
\begin{array}{l|ccccc}
\text{Line 3} & & \times & & & \\
\text{Line 2} & & \times & & [\times] & \\
\text{Line 1} & & \times & & \times & \\
& [_{\text{CP}} \ldots & \text{WH}_{\text{FOC}} \ldots & \beta & \ldots & \text{Q}]
\end{array}
$$

According to the prominence relations represented in (70), F_0-boosting on WH_{FOC} and the F_0-lowering on the post-FOCUS material (β) is expected.

(71)   *Embedded CP—Output*

[_{CP} … WH … β … Q]

Note that there is no need to specify the end point of PFR. The PFR Rule simply applies to all the material on the right of WH . Since only the embedded CP is created in the syntax, the material that belongs to the matrix clause has not yet been added to the structure. Therefore, even if the PFR applies to any material on the right of FOCUS, it does not affect the realization of the matrix material. Accordingly, there is no need to specify the end point of PFR to obtain the desired result.

The derivation continues to the matrix clause. (We are now skipping *v*P cycle).

(72) *Step II: Matrix CP*

$$[_{CP} \ldots \alpha \ldots [_{CP} \ldots \boxed{\text{WH}} \ldots \beta \ldots Q] \ldots \gamma \ldots]$$

Since the FOCUS feature on WH is already deleted after the application of the FIP Rules, this derivation contains no FOCUS feature. Accordingly, the FIP Rules do not apply at this cycle. Hence, in the grid representation, the default value, i.e., grid columns up to Line 2, will be assigned to all the matrix material, in this case, α and γ.

(73) *Grid for (72)*

```
Line 3 |                      ×
Line 2 |           ×          ×                    ×
Line 1 |           ×          ×       ×            ×
       | [CP ...   α   ... [CP ...   WH  ...  β  ...  Q ] ...  γ  ... ]
```

Note that the matrix material after the embedded clause (i.e., γ) is not affected by the FIP. Since there is no reduction effect that applies to γ, it is realized with default prominence. As a result, PFR after $\boxed{\text{WH}}$ ends at the end of the embedded clause. This is exactly what we found in (30b) in the previous chapter (§3.1.2). The grid representation correctly represents this pitch contour.

(30b) Náoya-wa [Mári-ga **náni**-o nomíya-de nónda **ka**] ímademo obóeteru
Naoya-TOP Mari-NOM what-ACC bar-LOC drank Q even.now remember
'Naoya still remembers what$_i$ Mari drank t_i at the bar.'

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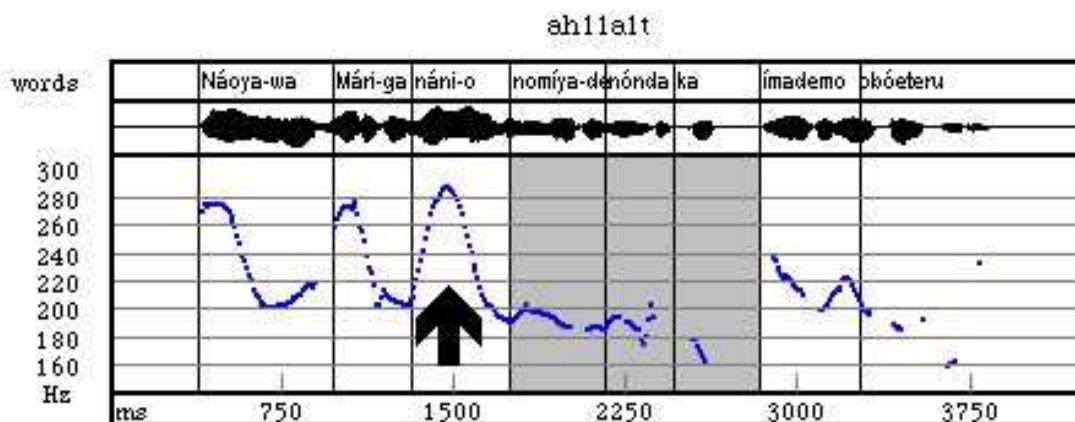
4.2.6 Example 2: Extraction from *Wh*-island

Let us look at another example from Ch. 3. We saw in §3.2.1 that the syntactically ambiguous sentence (34), repeated here, has two possible intonation patterns, each of which corresponds to one of the two readings of this sentence.[4]

(34) *Two intonation patterns for the two readings*

Náoya-wa   [Mári-ga   **náni**-o   nomíya-de nónda **ka**] ímademo obóeteru   **no**?
Naoya-TOP   Mari-NOM what-ACC bar-LOC   drank Q   even.now remember Q

a. 'Does Naoya still remember what$_i$ Mari drank t_i at the bar?'
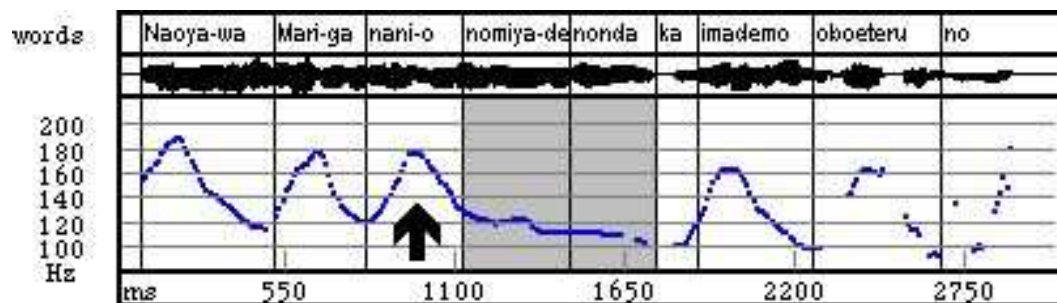
b. † 'What$_i$ does Naoya still remember whether Mari drank t_i at the bar?'
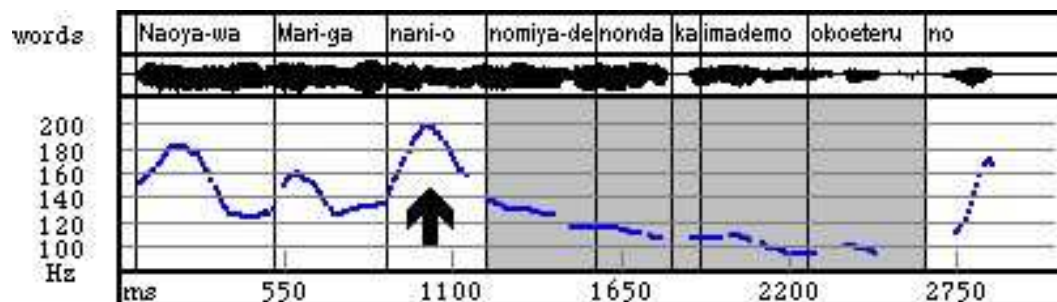
The derivation for (34a), in which the *wh*-phrase has the embedded scope, is exactly the same as that of (30b) illustrated above. An FIP is created at the embedded Spell-Out cycle. All the material in the matrix clause is thus not affected by the FIP, and hence realized in full pitch range. The Q-particle at the matrix clause is for a Yes/No-question interpretation, which does not assign a FOCUS feature to any *wh*-phrase. Therefore, it is not relevant to the realization of the FIP we are interested in.

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[4]As mentioned earlier, the pitch tracks for this example is obtained from the recordings of my own speech.

Let us look at the derivation of (34b), where the *wh*-phrase has the matrix scope. The schematic representation of the final output is the following:

(74)   *Final Output*

$[_{\text{CP}} \ldots \; \alpha \; \ldots \; [_{\text{CP}} \ldots \; \boxed{\text{WH}} \ldots \; \beta \; \ldots \; Q_{emb} \,] \; \ldots \; \gamma \; \ldots \; Q_{mat} \,]$

The embedded Q-particle in this reading behaves as a Yes/No-question particle. This Q-particle hence does not assign a FOCUS feature to the *wh*-phrase. Accordingly, the FIP Rules do not apply at this Spell-Out cycle. No prominence contrast is created at this point. The default grid columns are assigned.

(75)   *Step I: Embedded CP*

$[_{\text{CP}} \ldots \; \text{WH} \; \ldots \; \beta \; \ldots \; Q_{emb} \,]$

(76)   *Grid for (75)*

Line 2		×	×
Line 1		×	×
	$[_{\text{CP}} \ldots$	WH $\ldots$	$\beta \; \ldots \; Q_{emb} \,]$

The derivation continues to the matrix clause with the focus intonation yet to be realized. Here the matrix Q-particle (Q_{mat}) does assign a FOCUS feature to the *wh*-phrase.

(77)   *Step II: Matrix CP*

$[_{\text{CP}} \ldots \; \alpha \; \ldots \; [_{\text{CP}} \ldots \; \textbf{WH}_{\text{FOC}} \; \ldots \; \beta \; \ldots \; Q_{emb} \,] \; \ldots \; \gamma \; \ldots \; \textbf{Q}_{mat} \,]$

Accordingly, the FIP Rules apply to the derivation at this Spell-Out cycle. The *wh*-phrase projects its grid column up to Line 3, while the PFR Rule deletes ×'s of post-FOCUS material, in this case, β and γ. We obtain the following grid representation.

(78)   *Grid for (77)*

Line 3			×		
Line 2		×	×	[×]	[×]
Line 1		×	×	×	×
	$[_{\text{CP}} \ldots \; \alpha \; \ldots \; [_{\text{CP}} \ldots$	WH$_{\text{FOC}} \ldots$	$\beta \; \ldots \; Q_{emb} \,] \ldots$	$\gamma \; \ldots \; Q_{mat} \,]$	

In (78), the matrix material following the embedded clause (i.e., γ), is in the domain of PFR. Its $\times$ on Line 2 is deleted, just like that of β in the embedded clause. Accordingly, γ as well as β are post-FOCUS-reduced. The final output is as follows. This is exactly what we saw in (34b).

(79)   *Final Output*

$[_{CP} \ldots \alpha \ldots [_{CP} \ldots \boxed{\text{WH}} \ldots \beta \ldots Q_{emb}] \ldots \gamma \ldots Q_{mat}]$

(34)   Náoya-wa [Mári-ga **náni**-o   nomíya-de nónda **ka**] ímademo obóeteru **no**?
       Naoya-TOP Mari-NOM what-ACC bar-LOC   drank Q   even.now remember Q

   b.   † 'What$_i$ does Naoya still remember whether Mari drank t_i at the bar?'
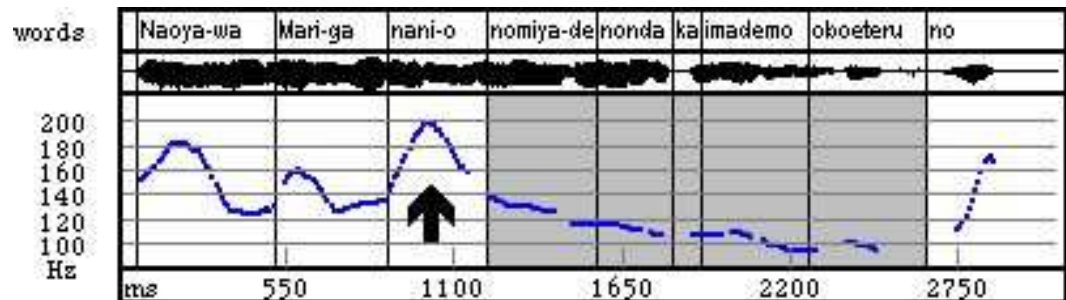
4.2.7   Example 3: Multiple *Wh*-question

The last example is multiple *wh*-questions. We saw in §3.3.1 that in a multiple *wh*-question sentence all the *wh*-phrases are P-focalized. Also, all the post-FOCUS phrases, including phrases between the two *wh*-phrases, is post-FOCUS-reduced.

(36a)   **dáre**-ga ano yóru **náni**-o   nomíya-de nónda **no**?
        who-NOM that night what-ACC bar-LOC   drank Q

        'Who drank what at the bar that night?'
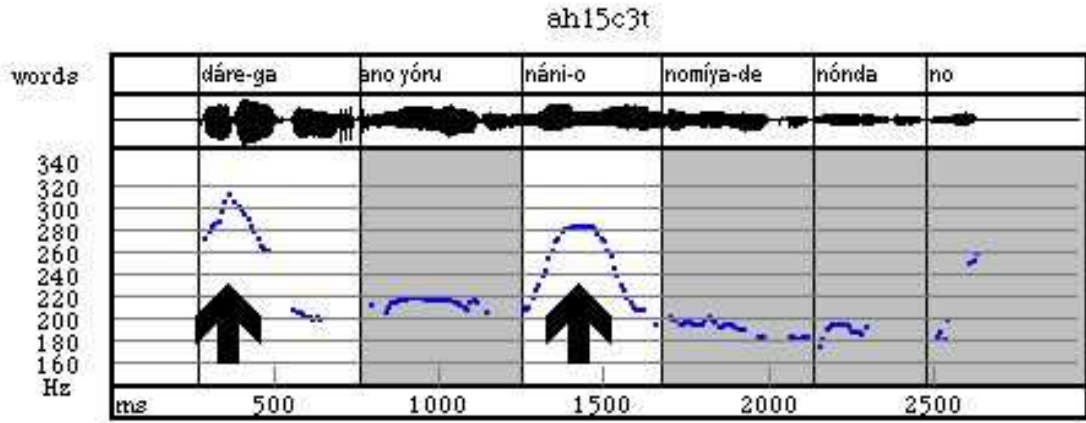
Let us apply the FIP Rules to the sentence above. First, we apply the P-focalization Rules to the two *wh*-phrases, projecting Line 3.

(80)   *P-focalization applied to (36a)*

Line 1	×		×		
Line 2	×	×	×	×	×
Line 1	×	×	×	×	×
	dáre$_{FOC}$	ano yóru	**náni**$_{FOC}$	nomíya	nónda no
	who	that night	what	bar	drank Q

Then, we apply the PFR Rule. In this example, the rule deletes the ×'s on Line 2 after the P-focalized phrases. We then obtain the following grid representation.

(81)   *PFR applied to (36a)*

Line 1	×		×		
Line 2	×	[×]	[×]	[×]	[×]
Line 1	×	×	×	×	×
	dáre	ano yóru	**náni**	nomíya	nónda no
	who	that night	what	bar	drank Q

We now have a grid column which lacks an × in the middle, i.e., one for the second *wh*-phrase *nani-o*. Since it is also one of the post-FOCUS phrases (in the sense that it follows the first *wh*-phrase), the × on Line 2 of this phrase would be deleted. Such a representation, however,

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is generally avoided in the metrical grid theory, due to the *Continuous Column Constraint* (Prince, 1983).

(82)   *Continuous Column Constraint*

A grid containing a column with a mark on layer $n+1$ and no mark on layer n is ill-formed. Phonological rules are blocked when they would create such a configuration.

(Cited from Hayes, 1995, p. 34, ex. (9))

In effect, this constraint blocks the application of the PFR Rule to the second *wh*-phrase in a multiple *wh*-question sentence. As a result, the PFR Rule triggered by the first *wh*-phrase only applies to the phrases between the first *wh*-phrase and the second *wh*-phrase, in this case, the adverbial phrase *ano yoru* 'that night'.[5]

(83)   *Grid for (36a)*

Line 1	×		×		
Line 2	×		×		
Line 1	×	×	×	×	×
	dáre$_{FOC}$	ano yóru	**náni**$_{FOC}$	nomíya	nónda no
	who	that night	what	bar	drank Q

4.2.8   Advantages of the Cyclic Model

There are advantages to the cyclic model proposed here. First, this model can easily derive the pitch contour of indirect *wh*-questions, as demonstrated above. Also, under this model there is no need to specify the end point of the PFR. Since the PFR applies within the

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[5]We may modify the definition of the PFR Rule so that the rule never violates the Continuous Column Constraint, as follows:

(i)   *PFR Rule (Modified version)*

Let α_{FOC} be a phrase with a FOCUS and β be a phrase without a FOCUS. If α_{FOC} precedes β and α_{FOC}'s peak (after P-focalization) is at Line n, then delete an × of β on Line $n-1$.

With this definition, the FOCUS phrase are excluded from the target of the PFR Rule. In the following discussion, we maintain the non-modified version for simplicity, and assume that the Continuous Column Constraint blocks the application of the PFR Rule to the FOCUS phrases.

relevant Spell-Out domain, the material outside of this domain is not affected, even though the end point of PFR is not marked. Non-cyclic models would have to account for the fact that the PFR stops at the embedded Q-particle only when it binds the *wh*-phrase. Note that the existence of a Q-particle does not always indicate the end of the PFR, as we saw in (34b). Whether it terminates at the embedded Spell-Out cycle or not crucially depends on whether the Q-particle is semantically associated with the *wh*-phrase or not. This association is in our model captured by the syntactic FOCUS-assignment operation. The phonology is only sensitive to the existence of FOCUS feature, and does not have to be sensitive to the syntactic/semantic property of the Q-particle.

Under the cyclic model proposed here, the Q-particle only plays a role in syntax as a FOCUS feature assigner, while it does not play any role in phonology. Due to its syntactic property as a functional head, together with the head-final property of Japanese, it always appears at the end of a Spell-Out domain. It is however not operating phonologically to stop the PFR. The PFR simply applies until the end of a Spell-Out domain, which coincides with where a functional head appears in syntax.

Under a non-cyclic model, the phonology must be able to specify the end point of PFR to derive a right intonation pattern for the indirect *wh*-question. In the case of IP-Prominence Theory (§2.3.2), for example, it needs to be said that there is another IP boundary after the embedded clause, which would block MaP dephrasing of the matrix material.

Recall the following two constraints, proposed in Sugahara (2003), regarding the realization of FIP.

(14) FOCUS-PROMINENCE

The FOCUS-marked constituent in the morpho-syntactic representation should correspond to a string of the phonological representation which contains the highest prominence (DTE, Δ) of an Intonational Phrase.

(Sugahara, 2003, p. 191)

(15) FOCUS-DEPHRASING—ALIGN$_R$(Δ_{IP}, IP)

The DTE (Δ) of an Intonational Phrase must coincide with the right edge of an

Intonational Phrase.

In an indirect *wh*-question, where the FOCUS-dephrasing stops at the end of the embedded clause, there must be an IP boundary between the end of the embedded clause and the matrix material that follows it in order to satisfy FOCUS-DEPHRASING. Otherwise the PFR would continue until the end of the sentence.

(84)   *IP boundary between the embedded clause and γ*[6]

$$(_{\text{IP1}} \qquad\qquad)(_{\text{IP2}} \quad \Delta \qquad\qquad)(_{\text{IP3}} \qquad)$$
$$[_{\text{CP}} \ \ldots\ \alpha \ \ldots\ [_{\text{CP}} \ \ldots \quad \boxed{\text{WH}}\ \ldots\ \beta\ \ldots\ \text{Q} \ ] \qquad \gamma \ \ldots\ ]$$

In the IP phrasing above, the left edge of IP2 is called for due to the FOCUS-PROMINENCE constraint together with the property of the IP prominence that it be aligned to the left edge of IP. There is, however, no constraint that calls for an IP boundary of IP3. The question is why and how this IP boundary is created. The answer does not appear to be trivial. An IP prominence is only assigned to a phrase with FOCUS, given FOCUS-PROMINENCE. If the material immediately after the embedded clause (i.e., γ) bears FOCUS, it would create an IP boundary on its left, deriving a wanted result. It is, however, unlikely that the material right after the embedded clause always bears FOCUS in indirect *wh*-questions, because it does not require any focus interpretation.

Adding another highly ranked constraint could be a solution. Postulating such a constraint, however, does not appear straightforward. An alignment constraint calling for an IP boundary at the end of embedded clause does not help, because there are cases where the PFR continues until the end of the matrix clause. Another possible IP alignment constraint, which calls for an IP boundary at the Q-particle does not help either, because there is also case where the PFR continues past a Q-particle, e.g., (34b). The right constraint should call for an IP boundary at the end of the embedded clause *only when* the scope of FOCUS is restricted in the embedded clause. A right model would require an additional mechanism to derive the FIP of indirect *wh*-questions.

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[6]Δ above WH indicates the IP prominence assigned to WH.

Another advantage is that the model proposed here can easily capture the FIP-*Wh*-Scope Correspondence, while maintaining the modularity of the two interface levels. The correspondence is the result of the property of the syntactic FOCUS-assignment operation in combination of Multiple Spell-Out mechanism. The information for semantics (focus semantics/WH-Q dependency) and for phonology (FOCUS feature triggering the application of the FIP Rules) are sent to the two interface levels at the same Spell-Out cycle. Note that this correspondence is a result of the syntactic operation (i.e., FOCUS-assignment). There is no direct interaction between the two interface levels. The semantic interpretation of focus/WH-Q dependency is processed at the semantic component completely independently from the phonological process of FIP formation. In the same way, the phonological information is processed at the PF component completely independently from the semantic process. Since this syntactic operation derives the correlation between the semantics and phonology, there is no need to postulate any phonological operation that affects semantics, nor any semantic operation that affects phonology.

4.3   Prediction: Embedding of an FIP into Another

The cyclic model proposed above makes an interesting prediction. Since each FIP is created at a particular Spell-Out cycle, if there are two independent WH-Q dependencies with different scopes within a single sentence, two FIPs should be created at different Spell-Out cycles. Therefore there could be a case in which one FIP is embedded inside another. The configuration in question is the following:

(85)   *Two WH-Q dependencies in a sentence.*

[WH1 ... [... WH2 ... α ... Q_{emb}] ... β ... Q_{mat}]
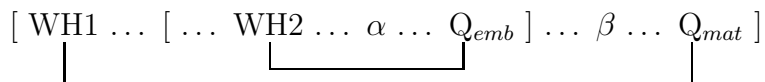
In (85), there are two WH-Q dependencies within a single sentence. The first *wh*-phrase (WH1) takes the matrix clause as its scope, while the second one (WH2) takes the embedded clause. The sentence is interpreted as a single (non-multiple) matrix *wh*-question containing a single indirect *wh*-question, such as 'Who remembers what Mari drank at the bar?'. In

this configuration, an FIP for the WH2–Q_{emb} dependency would be created first at the embedded clause, and then the other FIP for the WH1–Q_{mat} dependency would be created at the matrix clause. The PFR domain of the second FIP would contain the first FIP.

In such a pitch contour, there should be a P-focalized element within a PFR domain. The peak would be first raised by the P-focalization at the lower Spell-Out cycle, and then lowered by the PFR at the later cycle. The F_0 peak should be realized higher than it would if it were not P-focalized, but lower than a P-focalized element in a non-post-FOCUS domain. I will show in the next chapter that such an intonation pattern is in fact attested.

Such an intonation pattern is not expected under non-cyclic models. Under the IP-Prominence Theory reviewed in §2.3.2 (Truckenbrodt, 1995; Selkirk, 2003, etc.), for example, FOCUS is always assigned an IP prominence, regardless of whether the FOCUS phrase is embedded in another FIP or not. It is plausible to create a prosodic structure in which an IP is embedded into another, which violates Non-recursivity of the Strict Layer Hypothesis (Nespor and Vogel, 1986; Selkirk, 1984). In fact, Truckenbrodt (1999) proposed that when the WRAP XP constraint outranks the NONRECURSIVITY constraint, recursive prosodic phrasing is derived.[7] It is therefore possible to create an IP inside an IP.

Even if such a recursive structure is allowed, however, the realization of the IP prominence is not expected to be different from the non-recursive cases. Phrases with FOCUS feature would be all realized in the same way. Therefore, the theory expects no distinction between the realization of WH1 and WH2 in (85) above. As we will see in the next chapter, this is not what we observe when a FOUCS phrase is embedded in a post-FOCUS domain of another FIP. The realization of WH1 and WH2 are different. The F_0 of WH2 is substantially lowered by the PFR triggered by WH1. The IP-Prominence Theory would need an independent explanation for the realization of the embedded FOCUS phrase, aside from the non-embedded FOCUS phrase.

Under our model, on the contrary, we do predict different output for WH1 and WH2 in (85), while not assuming a different mechanism for the embedded FOCUS. WH2 is P-

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[7]Selkirk (1993) also proposes a case of recursive structure for Prosodic Word (PWd) to account for the variety of prosodic clitics.

focalized at the embedded Spell-Out cycle first. Then it is post-FOCUS-reduced at the matrix cycle. Cyclic application of the FIP Rules derives the embedding of FIPs without any additional assumption.

4.3.1 PFR Rule and FIP Embedding

Before examining the results of the experiment designed to test the proposed analysis, we need to consider how the two FIP Rules proposed in §4.1.1, repeated here, work in the Multiple Spell-Out model.

(45) *P-focalization Rule*

If α_{FOC} bears FOCUS, Add ×'s to α_{FOC} until a new line is formed.

(47) *Post-FOCUS Reduction (PFR) Rule*

If α_{FOC} bears FOCUS and precedes β, and α_{FOC}'s peak (after P-focalization) is at Line n, then delete an × of β on Line $n - 1$.

We need to closely examine how the PFR Rule works. The PFR Rule (47) is defined in such a way that it applies to a specific grid line $n - 1$. This restrictive behavior will be crucial in the cyclic model proposed in this thesis. This property makes some additional predictions, which we will discuss later in this section, (§4.3.2, §4.3.3). It also derives various welcome results.

Let us apply the FIP Rule to the FIP-embedding configuration (85), repeated below. (86) is an actual example from Japanese.

(85) *Two WH-Q dependencies in a sentence.*

[WH1 … [… WH2 … α … Q$_{emb}$] … β … Q$_{mat}$]
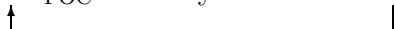
(86) **dáre**-ga [Mári-ga **náni**-o nomíya-de nónda **ka**] ímademo obóeteru **no**?
who-NOM Mari-NOM what-ACC bar-LOC drank Q even.now remember Q

'Who still remembers what$_i$ Mari drank t_i at bar?'

Under the Multiple Spell-Out model proposed here, the FIP for the embedded dependency between *nani-o* 'what-ACC' and *ka* 'Q' (i.e., WH2 and Q_{emb} in (85)) is created first at the embedded CP cycle. The embedded Q-particle (Q_{emb}) first assigns a FOCUS feature to WH2 *nani-o*.

(87) *Embedded CP cycle*

[Mári-ga **náni**$_{FOC}$-o nomíya-de nónda **ka**]

In the grid representation, an × is added to *nani-o* 'what-ACC' on Line 3, while ×'s of the post-FOCUS phrases (*nomiya-de* 'bar-LOC' and *nonda* 'drank') on Line 2 are deleted.
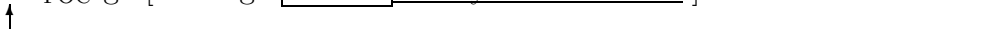
(88) *Grid for (87)*

Line 3		×		
Line 2	×	×	[×]	[×]
Line 1	×	×	×	×
	[Mári	**náni**$_{FOC}$	nomíya	nónda	**ka**]

The other dependency, i.e, the one between *dare-ga* 'who-NOM' and *no* 'Q' (WH1 and Q_{mat}), is created later at the matrix CP cycle. Q_{mat} assigns a FOCUS feature to *dare-ga*.

(89) *Matrix CP cycle*

[**dáre**$_{FOC}$-ga [Mári-ga **náni-o** nomíya-de nónda **ka**] ímademo obóeteru **no**?]

At this point, FIP Rules apply again. This time, the grid column of the first *wh*-phrase *dare-ga* 'who-NOM' is projected up to a new line, i.e., Line 4, by the P-focalization Rule. Also, the PFR Rule deletes × on Line 3 in the post-FOCUS domain. This means the PFR Rule only deletes the prominence on the *wh*-phrase *nani-o*.

(90) *Grid for (89)*

Line 4	×						
Line 3	×		[×]				
Line 2	×		×	×		×	×
Line 1	×		×	×	× ×	×	×
	[**dáre**$_{FOC}$	[Mári	**náni**	nomíya	nónda **ka**]	ímademo obóeteru	**no**?]

If the PFR Rule were defined in such a way that it deletes one × on each post-FOCUS phrases, as in (91), we would run into a problem.

(91)   *Post-FOCUS Reduction (PFR) Rule* (To be refuted)

   If α_{FOC} bears FOCUS and α_{FOC} precedes β, then delete an × on β.

Under this rule, we obtain the following grid representation for (89).

(92)   *(Wrong) grid for (89)*

Line 4	×							
Line 3	×		[×]					
Line 2	×	[×]	×				[×]	[×]
Line 1	×	×	×	[×]	[×]	×	×	

[**dáre**$_{\text{FOC}}$ [Mári **náni** nomíya nónda **ka**] ímademo obóeteru **no**?]

This representation has the problem that we faced before when we first introduced the grid representation. (90) shows deletion of pitch accents (Line 1), which does not take place in actual utterances. Since we do not want the deletion of pitch accents, this should not be the prediction this rule makes.

This version of FIP Rule implies that the PFR phenomenon is cumulative. Generally speaking, if the PFR Rule applies successive-cyclically, it keeps deleting a grid mark of an element each time it is applied. Successive-cyclic application of this operation, therefore, eventually could eliminate the pitch accent of the element.

By targeting a specific grid line, our version of PFR Rule successfully circumvents this problem. With our PFR Rule, ×'s on Line 1 will never be affected. Given the default grid line (Line 2), the P-focalization always projects a new line on Line 3 or higher. Accordingly, the PFR always apply to Line 2 or higher.

Note that the grid representation above still maintains the prominence relations established at the embedded CP cycle. The *wh*-phrase *nani-o* is more prominent than the post-FOCUS material within the embedded cycle, i.e., *nomiya-de* 'bar-LOC' and *nonda* 'drank'. Furthermore, the pitch reset effect after the embedded clause is also expected, since the matrix material after the embedded clause, i.e., *imademo* 'even.now' and *oboeteru* 'remember' has higher prominences than post-FOCUS material of the embedded clause.

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So far, we have considered the PFR phenomenon as an F_0-lowering phenomenon that applies to all the post-FOCUS phrases. Note, however, that the PFR Rule does not affect the grid columns of *all* the post-FOCUS phrases. It only affects the most prominent element(s) in the post-FOCUS domain. This does not mean, however, the F_0-realization of the post-FOCUS material that is not affected by the rule remains the same. The F_0-lowering effect is still expected in the whole post-FOCUS domain.

Let us consider the realization of phrases that maintain their grid columns at the default value (Line 2), e.g., the embedded subject *Mari-ga* in (90). Although the number of the grid line for these phrases is not altered throughout the derivation, the prominence represented by the default grid value (Line 2), would be realized differently depending on whether the highest grid line in the representation is Line 2 (i.e., the cases in which the FIP rules are never applied to the derivation), Line 3 (the cases in which the FIP Rules are applied once), or Line 4 (the cases in which the rules are applied twice). Since grid representations display relative prominence between grid columns, the realization of the prominence realized by the grid on Line 2 would be realized differently depending on the number of the highest grid line in the representation.

Look at the height of the grid on β in (93a) through (93c). In all the cases, β has the default grid column value, i.e., Line 2. If the highest grid line in the representation is Line 2, as in (93a), the prominence of β will be realized with a full pitch range in the phonetic realization. If the highest grid line is Line 3, as in (93b), the prominence of β will be realized a little lower than the highest prominence. If the highest grid line is Line 4, as in (93c), the prominence of β will be realized substantially lower than the prominence with Line 4 grid.

(93) *Relative Prominence in the grid representation*

    a. *Highest grid = Line 2*   b. *Highest grid = Line 3*   c. *Highest grid = Line 4*

Line 2	×	×	Line 3	×		Line 4	×	
			Line 2	×	×	Line 3	×	
						Line 2	×	×
Line 1	×	×	Line 1	×	×	Line 1	×	×
[	α	β]	[	α	β]	[	α	β]

This means that the PFR phenomenon is *not* entirely derived from the application of the PFR Rule. It is rather derived as the result of the application of the P-focalization Rule, which creates the highest prominence in the representation. The more times the P-focalization Rule applies to the derivation, the lower the values of the default and other unchanged grid will be realized.

PFR Rule as a prominence-deletion operation

The effect of the PFR Rule, then, is not simply lowering the F_0 of the post-FOCUS material. It is rather a prominence-deletion operation in the post-FOCUS domain. It deletes $\times$ on the specific grid line (i.e., Line $n - 1$, if the highest lien is Line n) to make the P-focalized grid column more prominent.

Note that, if the prominence assigned at the embedded cycle is deleted by the PFR Rule applied at the next cycle, the grid column on the FOCUS phrase is as high as non-post-FOCUS phrase. In the case of (90), for instance, the height of the embedded *wh*-phrase becomes the same as the subject *Mari-ga* after the prominence on the *wh*-phrase on Line 3 is deleted by the PFR Rule applied at the matrix cycle. In effect, the PFR Rule deletes the prominence created by the P-focalization Rule applied at the earlier cycle.

It should be noted, however, that this does not mean that the effect of P-focalization at the embedded cycle is completely canceled by the PFR at the next cycle. Consider a case in which the *wh*-phrase in the embedded clause is replaced with some non-FOCUS phrase. In that case, no FIP Rule application takes place in the embedded clause. Such a case is expected in the following example, where the embedded *wh*-phrase is replaced by an indefinite pronoun *nanika-o* 'something-ACC'.

(94) [| **dáre**-ga | [Mári-ga **nánika**-o   nomíya-de nónda **ka**] ímademo obóeteru
         who-NOM   Mari-NOM something-ACC bar-LOC   drank Q   even.now remember
      no?]
      Q

'Who still remembers whether Mari drank something at the bar?'

nanika-o 'something-ACC' in (94) does not bear FOCUS. Therefore it is not P-focalized at

the embedded CP cycle, unlike *nani-o* in (86). It is however post-FOCUS-reduced at the matrix CP cycle, just in the same way as *nani-o* is reduced. Since there is a P-focalization effect on *nani-o* (WH2) in (86) but not on *nanika-o* in (94), we expect a difference between the two.

In the grid representation of (94), there was no P-focalization at the embedded cycle. Hence Line 3 is not projected at the embedded cycle. Then the P-focalization Rule at the matrix cycle would project Line 3, and the PFR Rule applies to Line 2. The result would be like the following:

(95)   *Grid for (94)*

Line 3	×						
Line 2	×	[×]	[×]	[×]	[×]	[×]	[×]
Line 1	×	×	×	×	×	×	×

[**dáre**$_{\text{FOC}}$ [Mári **nánika** nomíya nónda ka] ímademo obóeteru no?]

This grid representation is different from (90) in two crucial respects: (1) No prominence contrasts in the embedded clause; (2) No pitch reset after the embedded clause. If there is P-focalization in the embedded clause, the grid column of the FOCUS phrase will have Line 2 after the PFR at the next cycle. If there is no P-focalization, the PFR Rule at the next cycle applies to Line 2 instead of Line 3. Therefore all the phrases in the embedded clause will have the grid marks only at Line 1. Given all these considerations, the P-focalization effect at the embedded cycle does have an effect, even though the prominence itself is deleted after all.

In sum, the restrictive property of the PFR Rule plays important roles in the Multiple Spell-Out model proposed in this thesis.

4.3.2   Non-cumulativity of PFR

The PFR Rule makes a few more predictions. First, the Rule indicates that the PFR is *not* a cumulative phenomenon, unlike downstep. Since the PFR Rule only applies to grid marks on a specific Line, any other grid mark below this line will be unaffected. Consequently, all

the prominence relations created in a lower Spell-Out cycle will be maintained even after another FIP is created at a higher Spell-Out domain. If there is another FIP-embedding in (90), as shown below, a new line Line 5 will be projected by the P-focalization Rule, and the PFR Rule only applies to Line 4. Therefore all the grid marks at Line 3 or lower will be intact.

(96)   *Yet another FIP embedding*

```
Line 5 │ ×
Line 4 │ ×        [×]
Line 3 │ ×         ×
Line 2 │ ×         ×      ×   ×                    ×              ×
Line 1 │ ×         ×      ×   ×       ×   ×        ×              ×
       │ [ α_FOC [ dáre [ Mári náni nomíya nónda ka ] ímademo obóeteru no? ] ]
```

The result of the experiment we will discuss in the next chapter in fact supports this prediction. We will discuss the non-cumulativity of PFR in §5.5.1.

4.3.3   Greater Prominence Contrast at the Matrix Cycle

Second, under this model, the prominence contrast between the P-focalized phrase and the post-FOCUS-reduced material is realized to a greater degree when it is not embedded in a larger FIP than in the case where it is embedded. If an FIP is not embedded, the difference of the number of ×'s between the P-focalized element and the post-FOCUS elements are at least two. If it is embedded in a larger FIP, on the other hand, the difference is reduced to one ×, because the PFR at the larger cycle deletes the prominence on the P-focalized element. The difference of the number of ×'s in such cases becomes only one, which is due to the PFR. We also discuss this prediction in §5.5.2.

4.4   Ch. 4: Summary

In this chapter, I first proposed the relative prominence analysis of FIP. This analysis derives the FIP by manipulating the prominence of the P-focalized phrase and those of post-FOCUS

phrases and creating the prominence contrasts. Since this analysis does not refer to any prosodic phrasing, it derives the non-structural effect of FIP in a straightforward way. The two FIP Rules, the P-focalization Rule and the PFR Rule, derive these effects.

(97)   *FIP Rules*

   (45) *P-focalization Rule*

   If α_{FOC} bears FOCUS, Add $\times$'s to α_{FOC} until a new line is formed.

   (47) *Post-FOCUS Reduction (PFR) Rule*

   If α_{FOC} bears FOCUS and precedes β, and α_{FOC}'s peak (after P-focalization) is at Line n, then delete an $\times$ of β on Line $n - 1$.

I next proposed a Multiple Spell-Out model of FIP formation. I argued that the FIP Rules (P-focalization/PFR) apply at the Spell-Out cycle at which the relevant C head (FOC/Q-particle/*mo*) assigns a FOCUS feature to the phrases to be P-focalized (FOCUS phrase/*wh*-phrase). This analysis allows the cyclic application of the FIP Rules, and accordingly, the embedding of an FIP into another.

In the FIP-embedding case, we would expect that some 'residue' of the P-focalization and the PFR will be observed in the embedded clause, even they are reduced by the PFR applied at the matrix cycle.

As we will see in the next chapter, 'residues' of P-focalization/PFR in the previous Spell-Out domain can indeed be detected inside a post-FOCUS domain created in the later Spell-Out domain. The realization of this P-focalized peak is different from the first P-focalized phrase.

We also discussed various predictions of this Multiple Spell-Out model, e.g., non-cumulativity of PFR, larger prominence contrast at the matrix cycle, etc. In the next chapter, I will present the experimental data that supports these predictions of the Multiple Spell-Out analysis. The data show that the embedding of an FIP into another is found at least in some speakers' speech. They also shows the results that are compatible with the predictions.

Chapter 5

An Experiment testing the Multiple Spell-Out Account

In order to test the cyclic model proposed in Ch. 4, an experiment was carried out. The question addressed in this experiment is "Is there any 'residue' of embedded FIP in (85)?"

(85)   *Two WH-Q dependencies in a sentence.*

[WH1 ... [... WH2 ... α ... Q$_{emb}$] ... β ... Q$_{mat}$]

5.1   Methods

The procedure of the experiment is summarized below.

Subjects

- Four female (AH, CS, CK, and NM) and one male (YY) non-linguists who were born and brought up in Tokyo area.

Data Acquisition and Analysis

- Data are recorded on a cassette tape using Marantz PMD221 tape recorder and Sony ECM-MS907 microphone. They are simultaneously recorded directly on an iMac using

SimpleSound software.

- One of the two data sources, whichever has a better quality for F_0 tracking[1], is used for measurement. For four subjects (AH, NM, CS, and KS), the data from the cassette tape were used, while the data directly recorded on iMac were used for the other one (YY).

- The data on cassette tapes were digitized using SimpleSound and Praat software.

- F_0 measurements are done using PitchWorks software.

- T-tests are done using Microsoft Excel.

Tasks

- Stimuli consisting of 32 target sentences (see below for detail) mixed with 104 filler sentences are provided in a pseudo-randomized order (so that two sentences from the same example set are not presented in a row).

- Each sentence is presented to the subject on a computer screen, one sentence at a time.

- Subjects are asked to first read the sentence (either aloud or quietly) to understand the meaning of the sentence, and then to read aloud for the recording.

- Each subject makes 3 recordings of the entire set of stimuli. Each recording uses a different pseudo-randomized order of the stimuli sentences.

5.2   Stimuli

There are four sentence types to be examined (A–D), which are schematically shown below.

(98)   *4 sentence types to be examined*

---

[1] I chose one of the two sources after sampling several utterances from both sources.

A. *Affirmative sentence with indirect* wh-*question* = (30b)

[Non-WH [... WH ... α ... $C_{[+Q]}$] β ... $C_{[-Q]}$]

B. *Affirmative sentence with indirect Yes/No-question* = (30a)

[Non-WH [... Non-WH ... α ... $C_{[+Q]}$] β ... $C_{[-Q]}$]

C. Wh-*question with indirect* wh-*question* = (86)

[WH [... WH ... α ... $C_{[+Q]}$] β ... $C_{[+Q]}$]

D. Wh-*question with indirect Yes/No-question* = (94)

[WH [... Non-WH ... α ... $C_{[+Q]}$] β ... $C_{[+Q]}$]

The two examples we saw in §4.3, i.e., (86) and (94), correspond to C and D, respectively. In addition to these two sentence types, A and B, are also examined for comparison. A is a single indirect *wh*-question. B is a indirect Yes/No-question. A and B correspond to the two sentences discussed in §3.1.2, where we examined the FIP of indirect *wh*-question. Type A corresponds to (30b), while Type B corresponds to (30a).

The following is an actual Japanese example of the four sentence types. The stimuli used in the experiment contain 8 sets of these 4 sentence types (= 32 sentences in total). (See Appendix A for the complete stimulus set.)

(99) A. Náoya-wa [Mári-ga **náni**-o nomíya-de nónda **ka**] ímademo obóeteru
       Naoya-TOP Mari-NOM what-ACC bar-LOC drank Q   even.now remember
       'Naoya still remembers what$_i$ Mari drank t_i at the bar.'

   B. Náoya-wa [Mári-ga **nánika**-o   nomíya-de nónda **ka**] ímademo
      Naoya-TOP Mari-NOM something-ACC bar-LOC drank Q   even.now
      obóeteru
      remember
      'Naoya still remembers whether Mari drank something at the bar.'

   C. **dáre**-ga [Mári-ga **náni**-o   nomíya-de nónda **ka**] ímademo obóeteru
      who-NOM   Mari-NOM what-ACC bar-LOC drank Q   even.now remember
      no?
      Q
      'Who still remembers what$_i$ Mari drank t_i at the bar?'

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D. **dáre**-ga [Mári-ga **nánika**-o   nomíya-de nónda **ka**] ímademo
   who-NOM   Mari-NOM something-ACC bar-LOC   drank Q   even.now

   obóeteru **no**?
   remember Q

   'Who still remembers whether Mari drank something at the bar?'

In the following discussion, we examine the F_0 peaks of certain relevant phrases. These peaks are labeled as P(eak)1 through P5, as follows:

(100)   *Labels of the relevant F_0 peaks*

   [(Non-)WH [… (Non-)WH … α … Verb C] β … C]

      P1   P2   P3   P4   P5

   P1 Matrix *wh*-phrase (or corresponding non-*wh*-phrase). The F_0 peaks on this phrase indicate the effect of P-focalization at the matrix CP cycle.

   P2 Embedded *wh*-phrase (or corresponding non-*wh*-phrase). The F_0 peaks on this phrase indicate the effect of P-focalization at the embedded CP cycle. For this position, indefinite phrases such as *nanika* 'something' and *dareka* 'someone'—which minimally contrast with *wh*-phrases, *nani* 'what', *dare* 'who', etc.—are used as the non-*wh*-counterparts.

   P3 Phrase immediately following P2. The F_0 peaks of this phrase show the effect of PFR effect on P2.

   P4 Embedded clause verb. This peak is not directly relevant to the test (because all the effects expected on this peak are exactly the same as those of P3), but helps us see more clearly the effect of pitch reset expected on P5.

   P5 Material immediately following the embedded clause. When there is a PFR at the embedded CP cycle, it stops at the end of the embedded clause. The F_0 peak on this phrase hence should exhibit a pitch reset. This means that P5 is not supposed to be affected by the PFR at the embedded CP cycle. It should however be lowered by the PFR at the matrix CP cycle when P1 is P-focalized.

In the next subsection, we will consider in detail the predictions that the proposed Multiple Spell-Out model will make.

5.3 Predictions

The types of phrases at P1 and P2 can be summarized as below:

(101) *Types of phrases of P1 and P2*

ex. #	P1	P2
A	Non-WH	WH
B		Non-WH
C	WH	WH
D		Non-WH

According to this chart, our model predicts which phrase yields which effect (P-focalization or PFR) in the examples. (98) is now repeated below with the P-focalization (box) and PFR (underline) indicated. Also, in order to facilitate the discussion below, each phrase is replaced with the labels we use (P1–P5). *Wh*/non-*wh*-distinction on P1 and P2 are marked with the subscript $_{[+WH]}$ and $_{[-WH]}$.

(102) *Stimulus set (with predicted P-focalization and PFR)*

    A. *Affirmative sentence with indirect* wh-*question*

       [P1$_{[-WH]}$ [... $\boxed{\text{P2}_{[+WH]}}$ $\underline{\text{... P3 ... P4}}$ C$_{[+Q]}$] P5 ... C$_{[-Q]}$]

    B. *Affirmative sentence with indirect Y/N-question*

       [P1$_{[-WH]}$ [... P2$_{[-WH]}$ ... P3 ... P4 C$_{[+Q]}$] P5 ... C$_{[-Q]}$]

    C. Wh-*question with indirect* wh-*question*

       [$\boxed{\text{P1}_{[+WH]}}$ [... $\boxed{\text{P2}_{[+WH]}}$ $\underline{\text{... P3 ... P4}}$ C$_{[+Q]}$] P5 ... $\underline{\text{C}}$$_{[+Q]}$]

    D. Wh-*question with indirect Y/N-question*

       [$\boxed{\text{P1}_{[+WH]}}$ [... P2$_{[-WH]}$ ... P3 ... P4 C$_{[+Q]}$] P5 ... $\underline{\text{C}}$$_{[+Q]}$]

In A, P2$_{[+WH]}$ is P-focalized and P3/P4 is reduced. In B, no FIP is created. In C, P1$_{[+WH]}$ is P-focalized at the matrix CP cycle. Accordingly, all the following phrases (P2, P3, P4, and

P5) are reduced. In addition, P2$_{[+WH]}$ and P3/P4 exhibit the P-focalization effect and PFR effect, respectively, which are assigned at the embedded cycle. In D, in contrast, P2$_{[-WH]}$ and P3/P4 are only expected to exhibit the PFR of the matrix cycle. The environments where P-focalization and PFR should appear is summarized in (103).

(103)   *Environments where P-focalization and PFR are expected*

Types of P1–P2		P1	P2		P3, P4		P5
A: [−WH] [+WH]		P-foc	$\sqrt{e}$ P-foc	PFR	$\sqrt{e}$	PFR	PFR
B: [−WH] [−WH]		P-foc	P-foc	PFR		PFR	PFR
C: [+WH] [+WH]		$\sqrt{m}$ P-foc	$\sqrt{e}$ P-foc $\sqrt{m}$ PFR		$\sqrt{e}\sqrt{m}$ PFR		$\sqrt{m}$ PFR
D: [+WH] [−WH]		$\sqrt{m}$ P-foc	P-foc $\sqrt{m}$ PFR		$\sqrt{m}$ PFR		$\sqrt{m}$ PFR

$\sqrt{e}$ and $\sqrt{m}$ mean 'occurs at the embedded/matrix cycle', respectively

In the remainder of this section, we will survey the predictions we can make about each peak (P1–P5). At this point, we do not use the metrical grid representation to make predictions. Although the metrical grid expresses prominence relations among phrases within a sentence, the cross-sentence comparison is not straightforward. We will use our metrical grid analysis of FIP later in the chapter, where we examine the predictions of the Multiple Spell-Out model discussed in §4.3.2 and §4.3.3 using the results of the experiment in detail.

In light of our current discussion, we will make predictions regarding the following two contrasts.

(104)   *Predicted Contrasts*

   a.   *P-focalization*

        If a phrase α is P-focalized, it will be realized higher than its non-P-focalized counterpart in the minimal pair.

   b.   *PFR*

        If a phrase β is post-FOCUS-reduced, it will be realized lower than its non-post-FOCUS-reduced counterpart in the minimal pair.

In principle, P-focalization is a F_0-boosting phenomenon. Therefore, if a phrase α is P-focalized, it is realized higher than it would be if it were not P-focalized. In the experiment

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here, we will make this kind of comparison by comparing the F_0 peak of *wh*-phrases and the non-*wh*-counterpart in the minimal pair. The two sentences being compared are only minimally different in that one sentence uses *wh*-phrase (and the Q-particle) while the other does not.

PFR, on the other hand, is a F_0-lowering phenomenon. Therefore, if a phrase β is post-FOCUS-reduced, it is realized lower than it would be when it is not reduced. This comparison can be made by comparing the F_0 peaks of the post-FOCUS phrase and its counterpart in the minimal pair that follows a non-*wh*-phrase.

5.3.1   P1

On P1, non-*wh*-phrases are used in A and B, while *wh*-phrases are used in C and D. Accordingly, P-focalization is expected in C and D, but not in A and B. Therefore, P1 in C and D is expected to be higher than in A and B, hence (105a).

(105)   *Prediction regarding P1*

    a.   C, D > A, B   (due to P-focalization on C and D)

5.3.2   P2

P2 is expected to show various contrasts, which are summarized below:

(106)   *Predictions regarding P2*

    a.   A > C   (due to PFR on C)

    b.   B > D   (due to PFR on D)

    c.   A > B   (due to P-focalization on A)

    d.   C > D   (due to P-focalization on C;

                                   'Residue' of embedded P-focalization)

Let us consider them one by one. First, due to the P-focalization on P1 in C and D, the PFR is expected in C and D (i.e., $\sqrt{m}$ in P2 column of (103)). Therefore P2 in C and

D is expected to be lower than that of A and B. More specifically, the minimal pairs to be compared in this case are A and C for one, and B and D for the other. P2 in A and C are both *wh*-phrases, hence to be P-focalized at the embedded cycle ($\sqrt{}_e$ in P2 column of (103)). Since only P2 of C will be post-FOCUS-reduced at the matrix cycle, it will be realized lower than A, hence (106a). In the same logic, P2 in B and D are the minimal pair, because they are both non-*wh*-phrases. They are different from each other in that only P2 of D is subject to PFR at the matrix cycle while P2 in B is not, hence (106b).

Second, between A and B, i.e., the two examples without a PFR effect on P2, A would show a higher peak than B, because P2 is P-focalized at the embedded cycle in A, but not in B ($\sqrt{}_e$ in P2 column of (103)), hence (106c).

Third, the same contrast is expected between C and D, i.e., the two examples with a PFR effect on P2. Even though in both cases P2 is reduced by PFR at the matrix cycle, P2 in C would appear higher than in B, because P2 in C is *wh*-phrase and hence P-focalized at the embedded CP cycle, hence (106d).

The last contrast, i.e., (106d), is particularly important in this experiment. This is the contrast due to the P-focalization inside an PFR domain. If this contrast is in fact observed, it is a 'residue' of P-focalization in the earlier Spell-Out cycle, and will support the model proposed here.

5.3.3   P3

P3 also provides more than one contrast, one of which is of particular importance.

(107)   *Predictions regarding P3*

    a.   B > A, C, D   (due to PFR on A, C, and, D)

    b.   D > C   (due to PFR on C; 'Residue' of embedded PFR)

Since B does not contain any *wh*-phrase, P3 in this example will never be reduced by PFR. All the other cases (A, C, and D), on the other hand, P3 receives PFR effect at the embedded

CP cycle and/or at the matrix CP cycle. Therefore P3 in B should appear the highest among them. Thus (107a) is obtained.

Furthermore, between C and D, both of which receive the PFR on P3 at the matrix CP cycle, C, but not D, further receives another PFR effect at the embedded CP cycle. If the 'residue' of FIP at the embedded CP cycle is to be observed in terms of PFR, we would expect this contrast to be observed. Therefore P3 in C would appear lower than in D, due to the PFR at the embedded CP cycle. This is (107b). Again the contrast (107b), if any, would be a 'residue' of PFR at the embedded CP cycle, and hence, will support the proposal.

5.3.4   P4

Our model makes exactly the same predictions about P3 and P4. So we won't be concerned with this peak very much in terms of the predictions.

(108)   *Prediction regarding P4*

   As (107)

Note, however, that P4 is the final and a (predicted) lowest peak in the embedded cycle. Immediately after this peak comes the peak of a phrase that belongs to the matrix cycle, namely P5. Given that verbs are generally subject to downstep (§2.1.4) and that the subsequent phrase P5 is at the left edge of a MaP following the Syntax-Prosody Mapping (4), we will observe a pitch reset from P4 to P5. Whether we observe a full pitch reset or just a smaller amount of reset will tell us whether P5 is subject to the PFR or not.

5.3.5   P5

P5 indicates the existence of pitch reset after the embedded clause.

(109)   *Prediction regarding P5*

   a.   A, B > C, D   (due to PFR on C, D)

   b.   A = B, C = D   (due to the lack of influence of the PFR applied at
                                            the embedded cycle)

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P5 indicates whether there is a PFR effect at the matrix CP cycle. In C and D, P1 is P-focalized. Therefore everything after P1 should exhibit PFR. On the other hand, A and B have no PFR effect at the matrix CP cycle, and hence exhibit P5 in full pitch range. As a result, P3 in C and D are lower than in A and B, hence (109a).

In addition to this, it has to be noted that the PFR created at the embedded cycle should not affect the realization of P5. Therefore P5 in A and B should appear at the same height, regardless the fact that the PFR is expected at the embedded CP cycle only in A. For the same reason, P5 in C and D should appear at the same height, even though the PFR is expected at the embedded CP cycle only in C. As a result, we obtain (109b).

Now let us examine the results of the experiment in the next subsection.

5.4   Results

First of all, a summary of the results is shown below.

- One subject (AH) out of five showed all the contrasts predicted by the Multiple Spell-Out model proposed here, both in terms of P-focalization and of PFR.

- One subject (KS) showed the predicted contrasts only in terms of PFR.

- Two subjects (CS, YY) did not show clear results, although it seems due to a problem in the experimental design.

- One subject (NM) did not show any clear contrast, even in the matrix CP cycle. This might be due to consistent focalization of the matrix subject, which induced the PFR of everything on its right.

Even though the 'residue' of the embedded FIP is not attested in all subjects' data, the results show that there are at least some speakers who do display the embedded FIPs. The realization of the embedded FIP is clearly different from that of the non-embedded FIPs. As we noted above, such a pitch contour would pose a problem to non-cyclic models,

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since they would have to assume a distinct FIP realization mechanism for embedded FIPs independently of that of non-embedded ones.

Let us examine each subject's result in detail.

5.4.1   Subject 1: AH

This female subject's results show all the contrasts predicted above. The mean values of P1–P5 are shown in (110) and Figure 5-1:

(110)   *AH: Mean Values (Hz)*

	P1	P2	P3	P4	P5
A	278.0	296.1	224.9	209.2	241.5
B	278.9	283.4	252.5	229.5	242.0
C	305.1	259.7	224.0	208.5	230.2
D	308.1	251.4	232.5	214.1	228.1

Let us examine the results of each peak.

AH: P1

Recall that we predict the contrast (105a) at P1, repeated here:

(105)   *Prediction regarding P1*

    a.   C, D > A, B   (due to P-focalization on C, D)

As is clear from the graph in Figure 5-1, (105a) is satisfied. The effect of P-focalization is observed in C and D. Between A and B, as well as between C and D, there is no statistically significant difference.

(111)   *AH: Contrasts in P1*

Mean Difference between ...	P		Statistically ...	Relevant Predictions
A–C	<	0.0001	Significant	(105a)
B–D	<	0.0001	Significant	(105a)
A–B	<	0.60	Not significant	
C–D	<	0.20	Not significant	
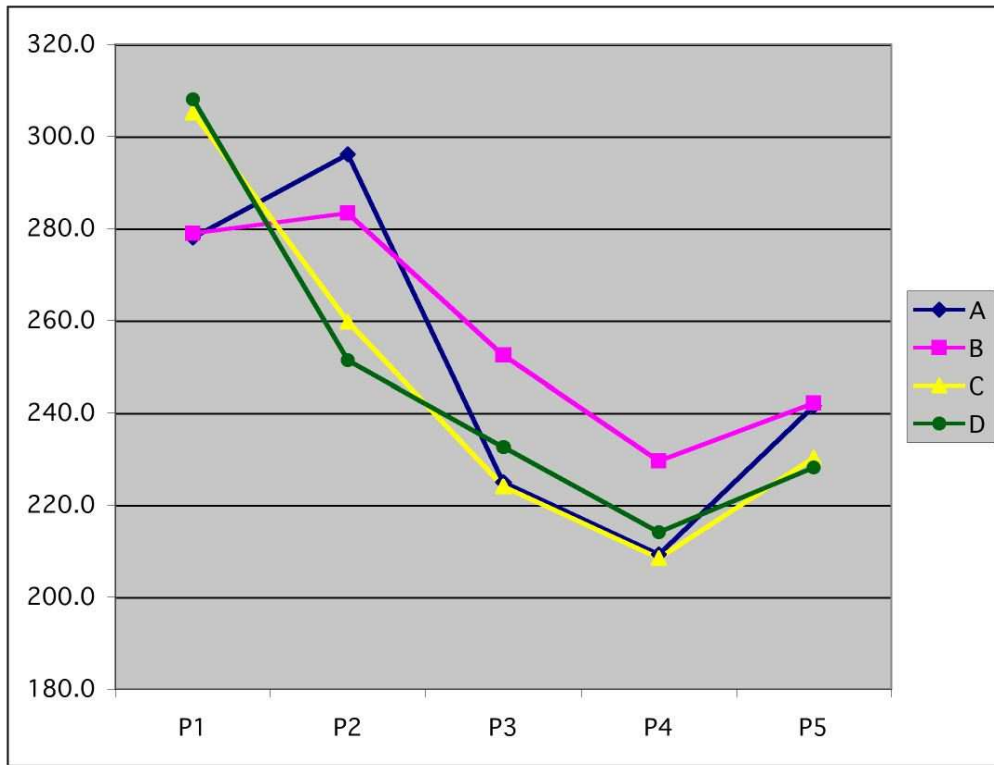
Figure 5-1: Speaker AH: Mean Values (Hz)

AH: P2

AH's data also exhibit all the contrasts in P2 either at a statistically significant level (P<0.001) or at a nearly significant level (P=0.05). First, the relevant predictions are repeated below:

(106)   *Predictions regarding P2*

    a. A > C   (due to PFR on C)

    b. B > D   (due to PFR on D)

    c. A > B   (due to P-focalization on A)

    d. C > D   (due to P-focalization on C;

                                  'Residue' of embedded P-focalization)

(106a) and (106b) can be confirmed by the significant difference between A and C, and between B and D, given in the first two rows of (112). Furthermore, there is a significant difference between A and B, confirming (106c). Regarding the last prediction, namely (106d), the contrast between C and D are at a nearly significant level.

(112)   *AH: Contrasts in P2*

Mean Difference between …	P		Statistically …	Relevant Predictions
A–C	<	0.0001	Significant	(106a)
B–D	<	0.0001	Significant	(106b)
A–B	<	0.002	Significant	(106c)
C–D	=	0.05	Almost significant	(106d)

The contrast between C and D is the 'residue' of embedded FIP. Although it is only nearly significant, the existence of this difference is consistent with the cyclic model proposed here.

AH: P3

AH also exhibits all the significant differences for the predictions regarding P3, repeated here.

(107)   *Predictions regarding P3*

    a.   B > A, C, D   (due to PFR on A, C, and, D)

    b.   D > C   (due to PFR on C; 'Residue' of embedded PFR)

As is clear from the graph in Figure 5-1, P3 in B, which has no PFR effect, is higher than any of the others, confirming (107a). Furthermore, C and D, i.e., those subject to the PFR at the matrix cycle, exhibit a statistically significant difference on P3 ($p < 0.002$). P3 in C, which is subject to the PFR in the embedded clause as well, is substantially lower than that of D, which is only reduced at the matrix cycle. The contrast between C and D is the 'residue' of the PFR at the embedded cycle. This supports the cyclic application of PFR operations.

(113)   *AH: Contrasts in P3*

Mean Difference between ...	P		Statistically ...	Relevant Predictions
A–B	<	0.0001	Significant	(107a)
B–D	<	0.0001	Significant	(107a)
C–D	<	0.002	Significant	(107b)

AH: P5   AH's results for P5 confirm the existence of different levels of pitch reset after the embedded CP cycle.

(109)   *Prediction regarding P5*

    a.   A, B > C, D   (due to PFR on C, D)

    b.   A = B, C = D   (due to the lack of influence of the PFR at the embedded cycle)

The pitch reset was observed in all A through D, as the rise from P4 to P5 in Figure 5-1 indicates. The amount of the reset, however, is different between A and B on the one hand and C and D on the other. A and B show a larger amount of reset than C and D. The difference between the two are statistically significant ($p < 0.0002$ between A and C, and $p < 0.0001$ between B and D). This contrast confirms that there is no PFR effect at the matrix cycle in A and B, while there is one in C and D. Especially notable is the pitch reset in A and C. P5 in A reaches to the same height as P5 in B, even though there is a PFR effect in the embedded CP cycle. This clearly indicates that the PFR in the embedded CP cycle has no effect on the material in the matrix CP cycle (see §3.1.2 for relevant discussion). The same analysis can be made to P5 in C. It reaches to the same height to P5 in D, even though only C undergoes the PFR in the embedded cycle. This contrast is maintained even when it is embedded in a PFR domain at the matrix cycle.

(114)   *AH: Contrasts in P5*

Mean Difference between ...	P		Statistically ...	Relevant Predictions
A–C	<	0.0002	Significant	(109a)
B–D	<	0.0001	Significant	(109a)
A–B	<	0.88	Not significant	(109b)
C–D	<	0.21	Not significant	(109a)

All in all, this speaker's data support the cyclic application of P-focalization and PFR. They show a contrast of P-focalized/non-P-focalized materials (P2) as well as a contrast of post-FOCUS-reduced/non-post-FOCUS-reduced materials (P3), even when it is embedded in a PFR domain.

5.4.2   Subject 2: KS

This subject's data did not show a clear 'residue' with respect to the P-focalization, which seems to be due to the fact that P-focalization effect is generally weak in KS's speech. Her data, however, did show substantial contrasts with respect to the PFR effect. Mean values are shown in (115) and Figure 5-2.

(115) *KS: Mean Values (Hz)*

	P1	P2	P3	P4	P5
A	291.5	281.6	237.6	214.4	254.2
B	292.6	283.2	258.2	225.9	259.8
C	297.3	278.0	236.5	212.8	238.5
D	303.5	272.9	253.0	222.1	234.2

KS: P1

Although the mean values of P1 in KS's data are relatively close to each other and much less separated than in AH's data, they exhibits the contrast predicted from the analysis: A, B > C, D. There is, however, another statistically significant contrast for which I have no explanation, i.e., C is lower than D.

(116) *KS: Contrasts in P1*

Mean Difference between …	P		Statistically …	Relevant Predictions
A–C	<	0.04	Significant	(105a)
B–D	<	0.0001	Significant	(105a)
A–B	<	0.60	Not significant	
C–D	<	0.009	Significant	Not predicted

KS: P2

Given the existence of contrasts in P2, we would expect the effects of P-focalization in P2 as well. There are not, however, clear contrasts in P2.

(117) *KS: Contrasts in P2*

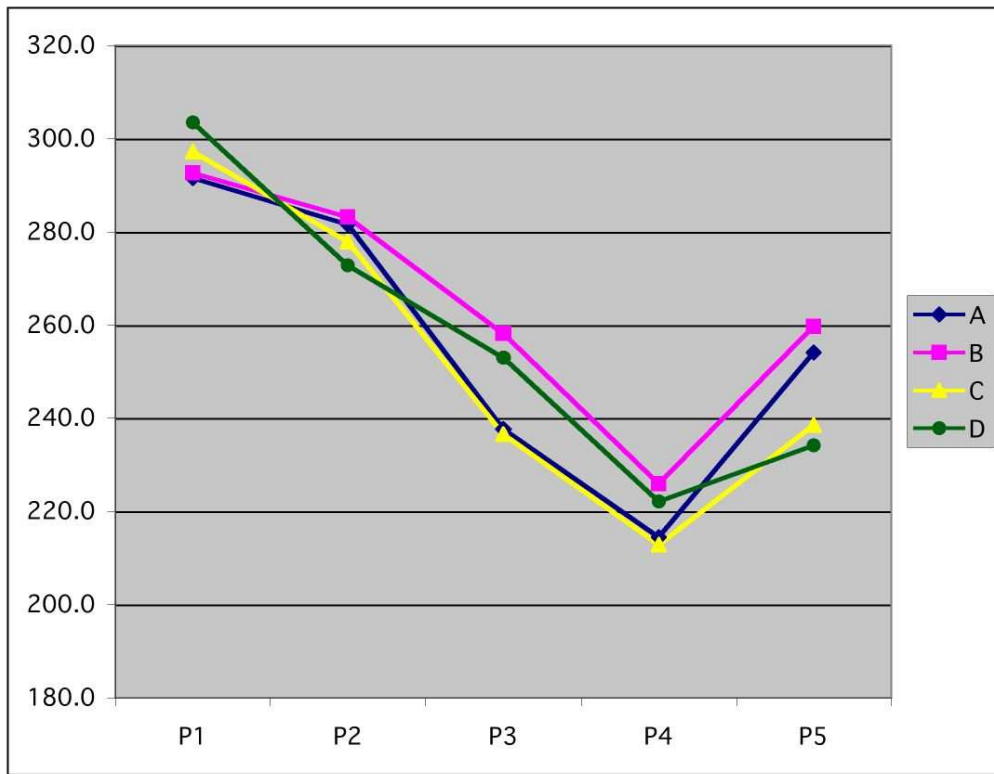| Mean Difference between …	P		Statistically …	Relevant Predictions
A–C	<	0.28	Not significant	*(106a)
B–D	<	0.0003	Significant	(106b)
A–B	<	0.60	Not significant	*(106c)
C–D	<	0.15	Not significant	*(106d)

Figure 5-2: Speaker KS: Mean Values (Hz)

Given the lack of contrast between A and B (106c), the P-focalization in P2 is very weak or just does not exist. Thus we should not expect such contrast in the PFR domain, namely, between C and D, either. Then we cannot examine whether we can observe the 'residue' of P-focalization.

It should be mentioned, however, that there is a clear contrast between B and D ($p < 0.001$). Also, C is lower than A, although the significance is not obtained as shown in the 1st row of (117). In that sense, the results do not contradict the prediction.

KS: P3

Although no clear 'residue' was found in P2, KS's data exhibit a clear case of 'residue' in P3, with respect to the PFR effect.

(118) *KS: Contrasts in P3*

Mean Difference between ...	P		Statistically ...	Relevant Predictions
A–B	<	0.0001	Significant	(107a)
B–D	<	0.009	Significant	(107a)
C–D	<	0.0001	Significant	(107b)

B, with no PFR, is the highest peak in P3. A is lower than B, because it is post-FOCUS-reduced at the matrix cycle, hence (107a). Another important contrast is between C and D. C is substantially lower than D, even though they are both post-FOCUS-reduced at the matrix cycle. This is because C is subject to another PFR effect at the embedded cycle. Since this contrast is statistically significant, it supports the cyclic model of FIP formation proposed here.

KS: P5

The expected contrasts are obtained in P5 as well. A and B show the same amount of pitch reset (the difference between them is not statistically significant: $p < 0.18$). C and D only show a smaller amount of pitch reset on P5, because P5 is post-FOCUS-reduced at the matrix cycle.

(119) *KS: Contrasts in P5*

Mean Difference between ...	P		Statistically ...	Relevant Predictions
A–C	<	0.001	Significant	(109a)
B–D	<	0.0001	Significant	(109a)
A–B	<	0.18	Not significant	(109b)
C–D	<	0.31	Not significant	(109a)

In sum, KS's data also exhibit the 'residue' of embedded FIP, but only with respect to PFR. Even though we could not observe a substantial contrast in the PFR domain (i.e., between C and D) of P2 that can be attributed to P-focalization, this lack of contrast does not necessarily falsify the analysis, because the contrast is not observed in the non-PFR domain (i.e., between A and B) either. For this speaker, P-focalization effect is generally weak for some reason.

5.4.3   Subject 3: CS

The other three subjects did not show clear 'residue' of the embedded FIP. Here I will attempt to explain the possible reasons for the lack of the predicted contrasts.

Let us look at the third speaker CS's data, shown in (120) and Figure 5-3:

(120) *CS: Mean Values (Hz)*

	P1	P2	P3	P4	P5
A	278.3	287.2	225.9	205.8	222.2
B	280.1	286.9	235.1	209.8	219.5
C	307.7	262.5	225.1	205.3	217.6
D	305.7	259.2	224.4	202.5	214.5

If we look at C and D in the graph in Figure 5-3, they are almost identical. In fact, no peak except P5 shows a significant difference.
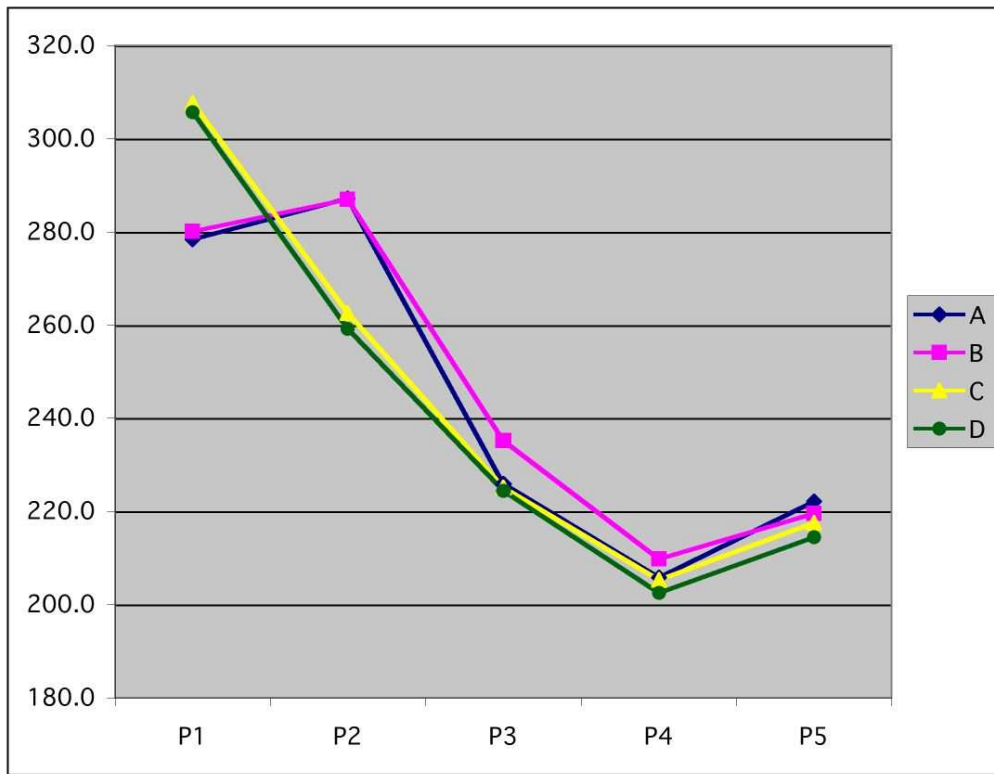
Figure 5-3: Speaker CS: Mean Values (Hz)

(121)   *CS: Difference between C and D*

	P1	P2	P3	P4	P5
C	307.7	262.5	225.1	205.3	217.6
D	305.7	259.2	224.4	202.5	214.5
Mean diff.	2.0	3.3	0.7	2.8	3.1
P $<$	0.46	0.46	0.86	0.11	0.051
Statistically	N/S	N/S	N/S	N/S	Nearly Sig.

If P2 in C is P-focalized but not in D, they would show differences in P2 and in P3, just like the data in the previous two speakers, AH and KS. This apparently indicates the WH-Q dependency in the embedded clause is not intonationally indicated. If this observation is correct, this data undermines the proposed model.

It is possible to consider, however, that this speaker have consistently P-focalized the non-*wh*-phrase at P2, which is an indefinite pronoun minimally contrasted with *wh*-phrase (e.g., *nanika* 'something' in contrast with *nani* 'what'). Although indefinites, unlike *wh*-phrase, are not assigned FOCUS by Q-particles, they optionally may be assigned one by FOC head. They are therefore in principle P-focalizable. If indefinites bear an optional FOCUS feature in this way, it will obscure the expected contrast between the *wh*- and the non-*wh*-phrase, because both *wh*-phrases (obligatorily with FOCUS) and indefinites (optionally with FOCUS) induce P-focalization as well as the subsequent PFR.[2]

There is in fact an indication that there is an extra FOCUS on P2 in D. A piece of evidence can be found on the (unexpected) difference in P5. As shown in (121), P5 in C and D show a statistically nearly significant difference: P5 in D is lower than that of C ($p = 0.05$).

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[2]P1 does not have this problem, since indefinites were not used for the non-*wh*-phrases. This is probably why CS exhibits a clear P-focalization effect in P1, but not in P2.

(122) *CS: Contrasts in P5*

Mean Difference between ...	P		Statistically ...	Relevant Predictions
A–B	<	0.28	Not significant	(109b)
A–C	<	0.05	Significant	(109a)
B–D	<	0.03	Significant	(107a)
C–D	=	0.05	Nearly Significant	*(109b)

Such a contrast is not expected, given (109b). P5 in A and B do not exhibit a contrast, as predicted in (109b). In the same way, C and D also should not display a contrast, which is however not the case.

This contrast may be attributed to the extra FOCUS on the indefinites in P2 of D. If there is no extra FOCUS on the indefinites in D, D should show the same amount of reset as C, which is lower than those of A and B. The fact that P5 in D is in fact yet lower than C could be because P5 in D is lowered due to a PFR effect induced by the extra FOCUS on the indefinite in P2. If indefinites in D (P2) is P-focalized by an extra FOCUS, its scope may well be the matrix clause instead of the embedded clause. If this is the case, the PFR after the P-focalized indefinites will continue until the end of the sentence, including P5. The difference of scope between the FOCUS on the *wh*-phrase in C and that of the indefinite in D appears on the amount of reset on P5. The FOCUS on the *wh*-phrase is interpreted at the embedded clause, and hence does not affect P5. The FOCUS on the indefinite in D, on the other hand, is interpreted at the matrix clause, and hence PFR domain contains P5. The contrast in P5 between C and D is otherwise unexpected. If this analysis is on the right track, her data does not necessarily undermine the cyclic model proposed here.

5.4.4   Subject 4: YY

This speaker's data look more or less similar to that of the first two speakers. In particular, they show an apparent 'residue' of embedded FIP. They however lack some of the important contrasts as well. As a whole, it is not as clear as in the case of the first two speakers' data whether this speaker's data supports the proposal.

(123) *YY: Mean Values (Hz)*

	P1	P2	P3	P4	P5
A	173.7	167.6	133.8	112.3	139.5
B	171.8	170.5	137.5	119.0	139.8
C	193.4	145.4	125.9	110.8	123.3
D	194.4	140.3	127.0	112.8	125.6
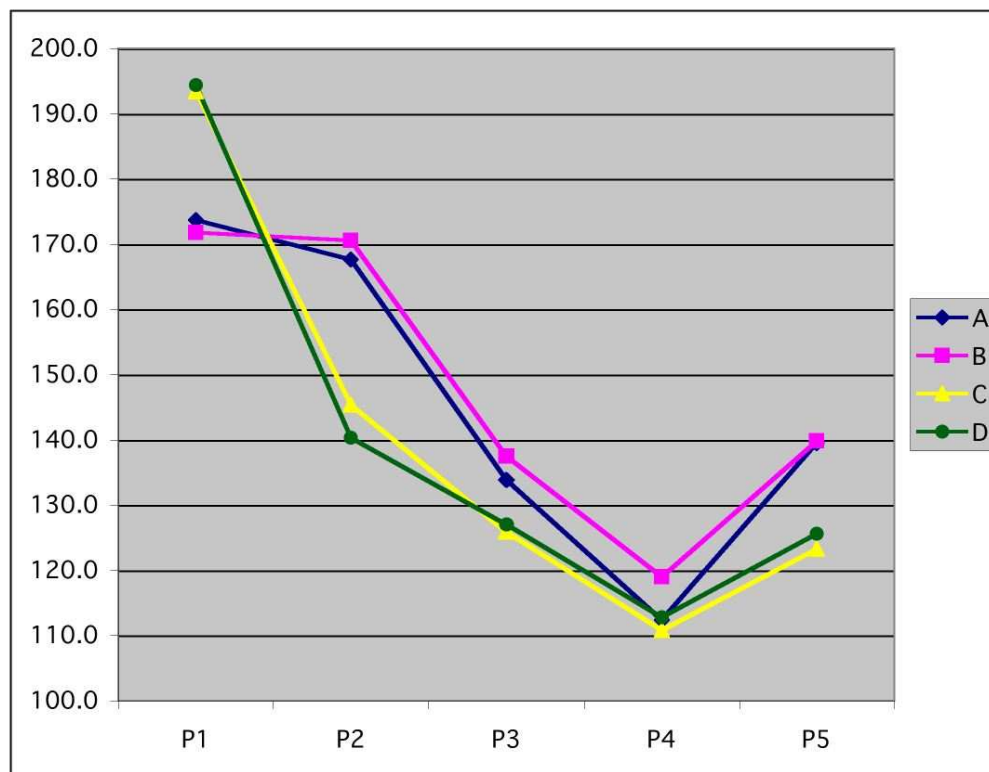
Figure 5-4: Speaker YY: Mean Values (Hz)

First of all, the graph in Figure 5-4 clearly show the P-focalization of P1 in C and D. They also show a clear contrast in terms of the amount of the pitch reset on P5 between A and B on one hand and C and D on the other. These facts show that P-focalization in C and D induces the PFR effect on P5, while such effects are not observed in A and B.

Such P-focalization/PFR effects are not as clear on P2 and P3 in the embedded clause. On P2, the P-focalization effect is not observed in A, which is unexpected. Accordingly there is not a significant difference between P2 in A and that of B ($p < 0.29$). Between C and D,

however, there is a significant contrast on P2 ($p < 0.01$). This contrast would represents the 'residue' of the P-focalization at the embedded CP cycle. It is, however, sceptical whether this contrast is real, given the lack of the expected contrast between A and B.

(124) *YY: Contrasts in P2*

Mean Difference between ...	P		Statistically ...	Relevant Predictions
A–B	<	0.29	Not significant	*(106c)
C–D	<	0.01	Significant	(106d)

On P3, neither between A and B nor between C and D exhibits a significant contrast to indicate the PFR effect in the embedded CP cycle.[3]

(125) *YY: Contrasts in P3*

Mean Difference between ...	P		Statistically ...	Relevant Predictions
A–B	<	0.15	Not significant	*(107a)
C–D	<	0.38	Not significant	*(107b)

In sum, this speaker does show a 'residue' of P-focalization in the embedded cycle, although this contrast cannot be confirmed from the other expected contrast. If the missing contrast in P2 between A and B are due to some other factor, this subject's data could be supporting evidence for the proposal.

5.4.5 Subject 5: NM

This speaker's data show almost no sign of FIP. All the four sentences show more or less the identical pitch contour, as shown in (126) and Figure 5-5.

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[3]The expected contrast between A and B, however, is clearly observed on P4 ($p < 0.0006$), to which all the predictions for P3 are carried over.

(126) *NM: Mean Values (Hz)*

	P1	P2	P3	P4	P5
A	319.2	251.5	219.0	183.6	188.9
B	313.3	248.5	221.9	189.0	189.6
C	317.4	243.5	207.5	183.6	188.9
D	317.3	256.1	220.0	184.5	190.0
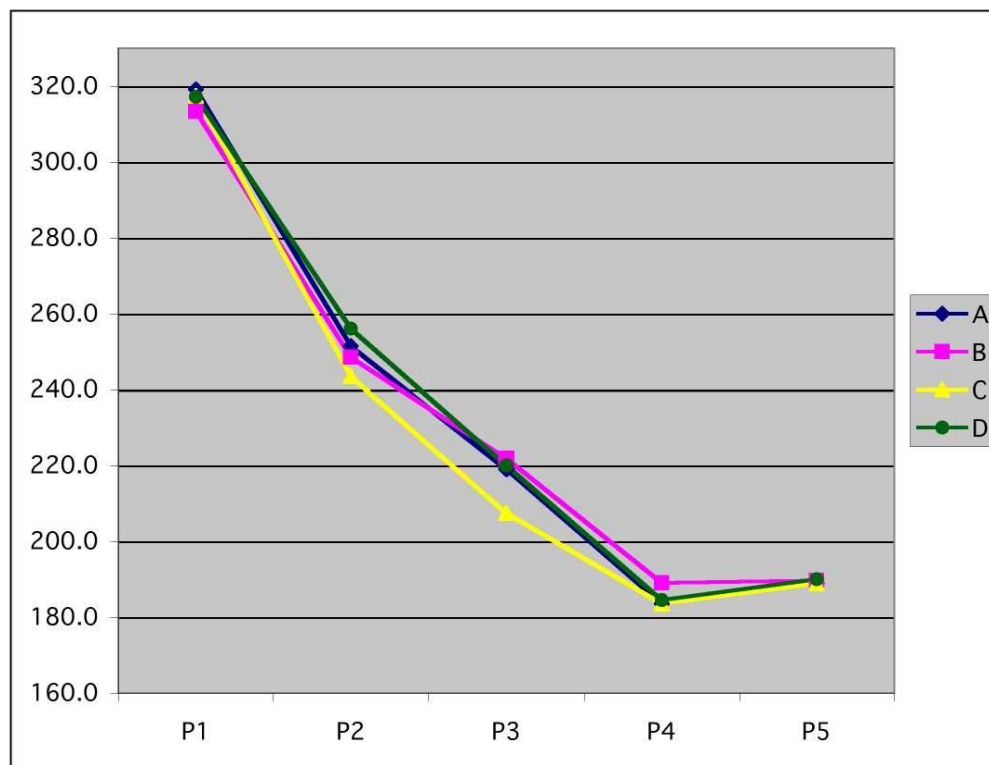
Figure 5-5: Speaker NM: Mean Values (Hz)

The only statistically significant difference is observed on P3. P3 in C is lower than that of A (107a), as well as that of D (107b). The latter contrast is supposedly the 'residue' of the PFR in the embedded cycle. It is, however, quite sceptical if this contrast is real, given that all the other expected contrasts are not observed. I have no explanation for this speaker's data. It is however safe to say that this speaker's speech pattern is quite different from the majority of speakers', and therefore, it can at best represent completely different dialectal pattern.

5.5   Discussion

In the experiment, we have been interested in whether there is a 'residue' of FIP on the embedded cycle even when it is embedded in another FIP of the matrix cycle. Specifically, the contrasts we have been most interested in are the contrast in P2 and P3 between example type C and D.

(102)   *Stimulus set (with predicted P-focalization and PFR)*

    A.   *Affirmative sentence with indirect* wh-*question*
        [P1$_{[-WH]}$ [… $\boxed{\text{P2}_{[+WH]}}$ … P3 … P4 C$_{[+Q]}$] P5 … C$_{[-Q]}$]

    B.   *Affirmative sentence with indirect Y/N-question*
        [P1$_{[-WH]}$ [… P2$_{[-WH]}$ … P3 … P4 C$_{[+Q]}$] P5 … C$_{[-Q]}$]

    C.   Wh-*question with indirect* wh-*question*
        [$\boxed{\text{P1}_{[+WH]}}$ [… $\boxed{\text{P2}_{[+WH]}}$ … P3 … P4 C$_{[+Q]}$] P5 … C$_{[+Q]}$]

    D.   Wh-*question with indirect Y/N-question*
   [$\boxed{\text{P1}_{[+WH]}}$ [… P2$_{[-WH]}$ … P3 … P4 C$_{[+Q]}$] P5 … C$_{[+Q]}$]

In C and D, P2 through P5 are all post-FOCUS-reduced due to the P-focalization of P1. Within this PFR domain, there is another WH-Q dependency at the embedded CP cycle in C, but not in D. If the FIP Rules apply cyclically at each relevant Spell-Out domain, P2 in C and D would show a contrast of P-focalize/non-P-focalized element, while P3 (and P4) would show a contrast of post-FOCUS-reduced/non-post-FOCUS-reduced element.

In fact, we found these contrasts in some (though not all) subjects' data. As we saw in AH's (and potentially YY's) data, we obtain a substantial difference between the P-focalized element in P2 and non-P-focalized element even when they are embedded in a PFR domain of a higher cycle. Furthermore, in AH's and KS's data, we also obtain substantial differences between the post-FOCUS-reduced material and non-post-FOCUS-reduced material in P3 even when they are embedded in a PFR domain.

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5.5.1 Non-cumulativity of PFR

If we look at AH's data, which shows both P-focalization and PFR in the embedded cycle, we can also make some additional interesting observations.

(127) *AH's result*
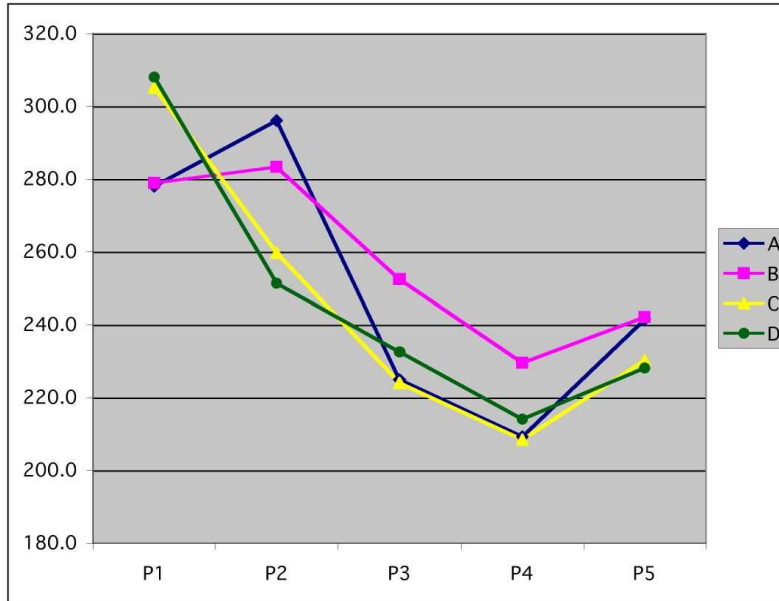
First, we can see that the PFR is not a cumulative phenomenon. Remember that P3 in A and C are subject to the PFR at the embedded cycle. In addition, P3 in C is subject to another PFR at the matrix cycle. As we can see, they are about the same height. If the PFR is cumulative, P3 in C should be realized lower than in A, because the operation is applied twice in C, while only once in A. Note also that P3 in D is higher than in A. P3 in D is subject to PFR only at the matrix cycle. Although both P3 in A and P3 in D are subject to PFR once, the amount of lowering effect on P3 is different: the amount of lowering is greater in A (in which the PFR applies at the embedded cycle) than in D (in which the PFR applies at the matrix clause).

Recall that the non-cumulativity of PFR is exactly what the PFR Rule predicts (see §4.3.2). The metrical grid analysis proposed above explains the difference between D on the one hand and A and C on the other, and more generally, the non-cumulativity of the PFR. By comparing the metrical grids for A, C, and D, we can explain the facts just described

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above.

Let us now examine the metrical grids for A, C and D. In A and C, where P3 establishes a prominence relation with P2 within the embedded CP cycle, P3 is lowered relative to P2.

(128)   *Embedded cycle for A and C*

```
Line 3 |   ×
Line 2 |   ×          [×]   [×]
Line 1 |   ×           ×     ×
       | [ P2[+WH]    P3    P4 ]
```

If P1 is a non-*wh*-phrase, as in A, grid columns for P1 and P5 are build up to the default level, i.e., Line 2.

(129)   *Matrix cycle for A (Final output)*

```
Line 3 |                  ×
Line 2 |   ×              ×                    ×
Line 1 |   ×              ×         ×    ×     ×
       | [ P1[−WH]   [ P2[+WH]    P3   P4 ]  P5 ]
```

If P1 is a *wh*-phrase, as in C, P1 adds grid marks until it projects a new line, i.e, Line 4. In addition, PFR eliminates grid marks on P3.

(130)   *Matrix cycle for C (Final output)*

```
Line 4 |   ×
Line 3 |   ×              [×]
Line 2 |   ×               ×                    ×
Line 1 |   ×               ×         ×    ×     ×
       | [ P1[+WH]    [ P2[+WH]    P3   P4 ]  P5 ]
```

On the other hand, in D, where there is no FIP within the embedded cycle, P3 is realized in the same level of prominence as P2.

(131)   *Embedded cycle for D*

```
Line 2 |   ×          ×     ×
Line 1 |   ×          ×     ×
       | [ P2[−WH]   P3    P4   ]
```

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At the matrix cycle, P1 and P5 project their columns up to Line 2. Then P1 adds another × by P-focalization, while the PFR Rule applies to Line 2 after P1, deleting ×'s.

(132)   *Matrix cycle for D (Final output)*

Line 3	×				
Line 2	×	[×]	[×]	[×]	[×]
Line 1	×	×	×	×	×
	[P1$_{[+\text{WH}]}$	[P2$_{[-\text{WH}]}$	P3	P4]	P5]

In grid representations, the amount of actual lowering is not specified. Grid marks will represent the relative prominence among the phrases within a sentence. It should be noted that in A and C, the prominence relation between P2 and P3 needs to be realized. In addition, P5 needs to be realized higher than P3, because P5 has a higher grid column than P3. In order to satisfy these requirements, the realization of P3 needs to be lower than P2 in A and C, as well as lower than P5.

On the other hand, in D, there is no prominence relation between P2 and P3. Furthermore, P5 is also as high as P3. Accordingly, the lowering effect on P3 is at the same level as P5. Then P3 in D is not lowered as much as P3 in A and C. P3 is therefore realized higher in D than in A and C.

5.5.2   Greater Prominence at the Matrix Cycle

As we discussed in §4.3.3, the PFR Rule predicts that a prominence contrast that is not embedded in a larger FIP is realized to a greater degree than in the case where it is embedded in another FIP. If we look at Figure 5-1, this prediction seems to hold in general. The difference of P2 between A and B, i.e., the P-focalization effect that is not embedded in a larger FIP, is clearly larger than the difference between C and D, which is the P-focalization effect that is embedded in a larger FIP. Similarly, the difference on P3, i.e., the PFR effect, is much greater between A and B than between C and D. The prediction is supported by this experimental data.

5.6　Ch. 5: Summary

In this chapter, I presented experimental data that support the Multiple Spell-Out analysis. Although the expected results were not found in every subject's speech, nor in every expected environment, there is evidence that 'residues' of FIP are indeed found within a PFR domain.

One speaker, AH, displays the 'residue' of both P-focalization and PFR. Another speaker, KS, shows the 'residue' of PFR. Yet another speaker, YY, allegedly shows the 'residue' of P-focalization. The data of one speaker, CS, exhibit neither. This may be attributable to an extra FOCUS assigned on the non-*wh*-phrase which obscures the otherwise expected contrast.

Also, we discussed some observations about how the data are explained under the metrical grid analysis. The non-cumulative nature of the PFR, which is predicted from the proposed PFR Rule, is in fact found in the data. The analysis correctly predicts the contrasts observed in the data.

Chapter 6

Multiple WH-Q dependency

In this chapter, we will examine cases where two FIPs are expected in a single sentence. We have already discussed one such case in Ch. 5 when we examined the FIPs embedded in another FIP (see the sentence type C (98C) of the experiment stimuli). As we have seen so far, WH-Q dependencies are marked with FIPs. In this chapter, we discuss one more case like that, where two WH-Q dependencies cause a conflict between the two requirements they need to satisfy.

First we discuss the asymmetry between the two cases of multiple WH-Q dependency configurations, where the two WH-Q dependencies form a linearly nesting configuration in one case and they form a linearly crossing configurations in the other. Second, in order to account for the nesting-crossing asymmetry, I propose the *Relative Prominence Constraint*, which is also responsible for the application of the FIP Rules proposed earlier (§4.1.1). Lastly, we discuss apparent exceptional cases, where the sentences are exempt from the Relative Prominence Constraint. It will be shown that givenness has the effect of exempting sentences violating the Relative Prominence Constraint. In particular I claim that contextually given WH-Q dependencies are exempt from this constraint.

6.1 Nesting-Crossing Dependency Asymmetry

In this section, we will examine a syntactically ambiguous sentence which can potentially contain two WH-Q dependencies. There is, however, a certain restriction in terms of the possible combination of the WH-Q dependency. We will discuss the source of this restriction.

6.1.1 A missing reading

Let us look at (133), in which there are two *wh*-phrases in the embedded clause and both the embedded and the matrix clause are headed by Q-particles, *ka* and *no*, respectively.

(133) Náoya-wa [**dáre**-ga **náni**-o nomíya-de nónda **ka**] ímademo obóeteru **no**?
       Naoya-TOP   who-NOM   what-ACC bar-LOC   drank Q   even.now remember Q

Wh-phrases must be bound by one of the two Q-particles. Given that there are two *wh*-phrases in the c-commanding domain of the two Q-particles, this sentence logically has four possible combinations of WH-Q dependencies, as shown in (134):

(134) *4 potential readings*

   a. *Both* wh-*phrases bound by* Q_{emb}.

       [... [who ... what ... Q_{emb}] ... Q_{mat}]

       'Does Naoya still remember [who drank what at the bar]?'

   b. *Both* wh-*phrases bound by* Q_{mat}

       † [... [who ... what ... Q_{emb}] ... Q_{mat}]

       'For which person x, for which drink y, does Naoya still remember [that x drank y at the bar]?'

   c. *1st* wh-*phrase 'who' bound by* Q_{mat}, *2nd* wh-*phrase 'what' bound by* Q_{emb}

       † [... [who ... what ... Q_{emb}] ... Q_{mat}]

       'For which person x, does Naoya still remember [for which drink y, x drank y at the bar]?'

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d. *1st* wh-*phrase* 'who' *bound by* Q_{emb}, *2nd* wh-*phrase* 'what' *bound by* Q_{mat}

    * [... [who ... what ... Q_{emb}] ... Q_{mat}]

    'For which drink y, does Naoya still remember [for which person x, x drank y at the bar]?'

As indicated by '*', the reading in (134d) appears to be unavailable. (We will discuss an exceptional case in §6.2.) This fact, especially the contrast between (134c) and (134d), has been reported in the literature (Saito, 1982, 1987, 1994; Kurata, 1991; Shimoyama, 2001). Given the '*wh*-island effect' (marked by '†', see §3.2.1 for discussion), whose acceptability varies to a considerable degree among speakers, there is difference in the degree in the acceptability of (134b) and (134c) in general. The asymmetry between (134c) and (134d), however, is consistent among the researchers reporting this phenomenon. The following judgment is from Shimoyama (2001), who finds rather severe '*wh*-island effects'.[1]

(135)   Taroo-wa [Yamada-ga   **dare**-ni **nani**-o   okutta **ka**] tazunemasita **ka**?
         Taro-TOP   Yamada-NOM who-DAT what-ACC sent   Q   asked   Q

   a.   'Did Taro ask what Yamada sent to whom?'   ($\approx$ (134a))

   b. ?* 'Who$_j$ did Taro ask whether Yamada sent what to t_j ?'   ($\approx$ (134b))

   c. ?* 'Who$_i$ did Taro ask what Yamada sent to t_i ?'   ($\approx$ (134c))

   d.   * 'What$_j$ did Taro ask to whom Yamada sent t_j ?'   ($\approx$ (134d))

                                    (Shimoyama, 2001, p. 15, ex. (10))

Given that the readings (135b)–(135d) are subject to the '*wh*-island effect' (for which she puts '?*'), the degraded judgments are expected for the three interpretations. The contrast between (135b) and (135c) on one hand and (135d) on the other, however, cannot be explained only with the '*wh*-island effect'. Shimoyama also reported the same contrast in a *Mo*-construction example.

---

[1]The judgements given here is due to Shimoyama (2001). Hence the '*wh*-island effect' is described with '?*', not with our convention '†'. Also, the order of the examples is modified to match the order given in (134).

(136) [[∅ [Yamada-ga **dare**-ni **nani**-o okutta **ka**] sitteiru] syoonin]-**mo**
Yamada-NOM who-DAT what-ACC sent Q know witness -MO
damatteita
was.silent

a. 'The witness who knew what Yamada sent to whom was also silent.'

(≈ (134a))

b. * 'For every person x, for every thing y, the witness who knew whether Yamada
sent x to y was silent.' (≈(134b))

c. * 'For every person x, the witness who knew what Yamada sent to x was silent.'

(≈ (134c))

d. ** 'For every thing y, the witness who knew to whom Yamada sent y was silent.'

(≈ (134d))

(Shimoyama, 2001, p. 15, ex. (12))

Similarly, Saito (1982, 1987, 1994) reported the contrast between (134c) and (134d). (See also Kurata, 1991 for relevant discussion.)

(137) kimi-wa [**dare**-ga **dono hon**-o tosyokan-kara karidasita **ka**] sira-nai no?
you-TOP who-NOM which book-ACC library-from borrowed Q know-NEG Q
'(Lit.) You want to know who checked out which book from the library.'

a. ?? 'For which person x, you want to know which book x checked out from the
library.' (≈ (134c))

b. * 'For which book y, you want to know which person checked out y from the
library.' (≈ (134d))

(Cited in Kurata, 1991, p. 16, ex. (11))

Importantly, Saito pointed out that this contrast is related to the surface order of the two *wh*-phrases, but not to their original syntactic positions. When the second *wh*-phrase *dono hon-o* 'which book-ACC' is scrambled above the first *wh*-phrase *dare-ga* 'who-NOM', the available reading will be the opposite.

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(138) kimi-wa [**dono hon**$_i$-o **dare**-ga t_i tosyokan-kara karidasita **ka**] sira-nai
     you-TOP which book-ACC who-NOM library-from borrowed Q know-NEG
     no?
     Q

'(Lit.) You want to know who checked out which book from the library?'

a.   * 'For which person x, you want to know which book x checked out from the library.'   ($\approx$ (134d))

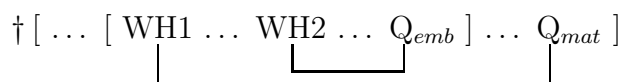b.   ?? 'For which book y, you want to know which person checked out y from the library.'   ($\approx$ (134c))

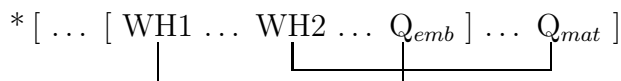   (Cited in Kurata, 1991, p. 17, ex. (12))

Saito suggested that the WH-Q association is subject to some kind of linear crossing constraint (cf. Baker, 1977): Two WH-Q dependencies cannot make a crossing path.[2]

(139)   *Nesting-Crossing Asymmetry*

a.   *Nesting Configuration* = (134c)

      † [... [WH1 ... WH2 ... Q_{emb}] ... Q_{mat}]

b.   *Crossing Configuration* = (134d)

      * [... [WH1 ... WH2 ... Q_{emb}] ... Q_{mat}]

---

[2] The linear crossing constraint is stated as follows:

(i)   Suppose a sentence contains $\langle \text{wh}_1, \ldots, \text{wh}_n, Q_1 \ldots, Q_m \rangle$, where wh_i precedes wh_{i+1} and Q_j precedes Q_{j+1}. Then, the *wh*-phrases and the Q-morphemes must be associated at S-structure as follows:

a.   Every *wh* is linked to a Q-morpheme. If wh_i is linked to Q_j, then no wh_h, h > i, is linked to Q_k, k > j.

b.   If the maximal sequence of *wh*-phrases linked to Q_j is $\langle \text{wh}_i, \ldots, \text{wh}_{i+k} \rangle$, then wh_{i+k}, the last member of the *wh* sequence, is coindexed with Q_j.

                                    (Saito, 1994, p. 198, ex. (10))

A question that arises here is why *linearity*, instead of syntactic *hierarchy*, matters for the computation of WH-Q dependency. There is one key factor about this asymmetry. In Saito (1994), he mentions in a footnote that "[(138b)] requires stress on *dono hon-o* (Saito, 1994, fn. 6)." This suggests that certain readings are associated with particular intonation contours, just as we discussed so far. Since we now know better about the mechanism behind FIP in Japanese, we are in a good position to explore this question, by looking at the intonation pattern of the sentence above, and examine how it interacts with the interpretation. As we will see, the contrast between (134c) and (134d) is derived from the prosodic constraint required by FIP formation.

6.1.2 Intonation patterns for the Multiple WH-Q sentence

If we look at the intonation pattern of (134), each of the three acceptable readings (134a)–(134c) is accompanied by a specific intonation pattern that is distinct from those of the others, as shown below:[3]

(134) Náoya-wa [**dáre**-ga **náni**-o nomíya-de nónda **ka**] ímademo obóeteru **no**?
       Naoya-TOP who-NOM what-ACC bar-LOC drank Q even.now remember Q

a′. *Both* wh-*phrases bound by* Q_{emb}.

[… [who … what … Q_{emb}] … Q_{mat}]

'Does Naoya still remember [who drank what at the bar]?'
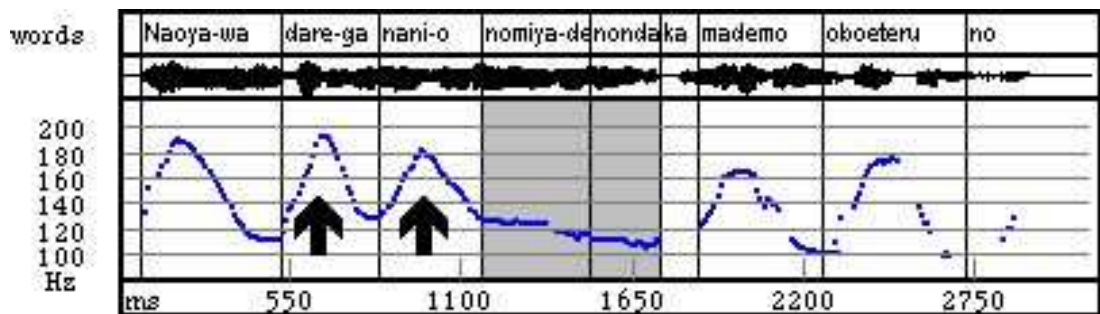
b′. *Both* wh-*phrases bound by* Q_{mat}

---

[3]The pitch tracks are obtained from the recording of my own speech.

† [... [who ... what ... Q_{emb}] ... Q_{mat}]

'For which person x, for which drink y, does Naoya still remember [that x drank y at the bar]?'
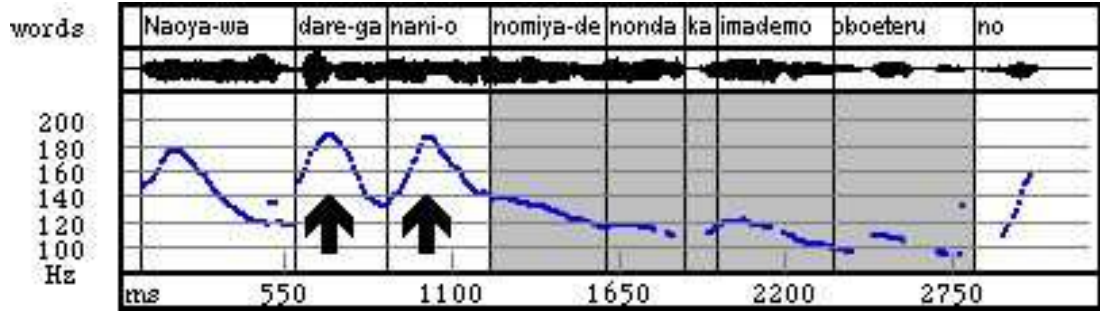
c′ *1st* wh-*phrase* 'who' *bound by* Q_{mat}, *2nd* wh-*phrase* 'what' *bound by* Q_{emb}

† [... [who ... what ... Q_{emb}] ... Q_{mat}]

'For which person x, does Naoya still remember [for which drink y, x drank y at the bar]?'

In (134a′), the two wh-phrases are P-focalized, and the PFR continues until the end of the embedded clause. In (134b′), the PFR domain extends to the end of the matrix clause. In (134c′), only the first wh-phrase *dare-ga* 'who-nom' shows a clear P-focalization effect, and the PFR starts after the first wh-phrase until the end of the matrix clause. The second wh-phrase is in the PFR domain. These pitch contours are all predicted from the analysis proposed in this thesis. Let us look at how these intonation patterns are derived.

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Deriving (134a)

(134a) is a multiple indirect *wh*-question. FOCUS features are assigned to the *wh*-phrases at the embedded Spell-Out cycle, and the FIP Rules apply accordingly. The two *wh*-phrases *dare-ga* and *nani-o* are P-focalized, while the post-FOCUS material within the embedded cycle is post-FOCUS-reduced. After FOCUS features are deleted at the embedded cycle by the application of the FIP Rules, no FIP formation process takes place in the matrix cycle. (See §4.2.7 for the illustration of the FIP formation in multiple *wh*-questions.)

(140) *Grid for (134a)*

    a. *Embedded Spell-Out cycle*

```
Line 3 |   ×         ×
Line 2 |   ×         ×          [×]  [×]
Line 1 |   ×         ×           ×    ×
       [ dáreFOC  nániFOC  nomíya  nónda  ka ]
          who      what     bar     drank  Q[+WH]
```

    b. *Matrix Spell-Out cycle*

```
Line 3 |            ×     ×
Line 2 |   ×        ×     ×                    ×          ×
Line 1 |   ×        ×     ×     ×     ×        ×          ×
       [ Náoya [ dáre  náni  nomíya  nónda  ka ]  ímademo  obóeteru   no? ]
          Naoya  who   what   bar     drank  Q    even.now remember   Q[−WH]
```

This grid appropriately represents the pitch contour in (134a′): P-focalization on the two *wh*-phrases; PFR within the embedded clause; and pitch reset on the matrix material after the embedded clause.

(134) a′.
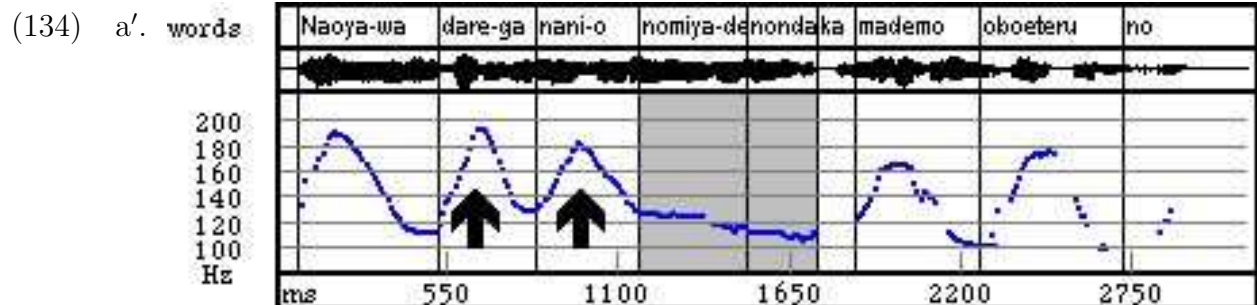
Deriving (134b)

(134b) is a multiple matrix *wh*-question. Therefore FIP is created at the matrix cycle. In this case, FOCUS features are assigned to the *wh*-phrases by the matrix Q-particle. Hence, the FIP Rules apply at the matrix cycle.

(141)   *Grid for (134b)*

    a.   *Embedded Spell-Out cycle*

```
Line 2 |  ×    ×       ×    ×
Line 1 |  ×    ×       ×    ×
       | [ dáre náni nomíya nónda ka ]
       |   who  what bar    drank Q[−WH]
```

    b.   *Matrix Spell-Out cycle*

```
Line 3 |              ×          ×
Line 2 |  ×    ×       ×        [×]  [×]      [×]          [×]
Line 1 |  ×    ×       ×         ×    ×        ×            ×
       | [ Náoya [ dáreFOC nániFOC nomíya nónda ka ] ímademo obóeteru  no? ]
       |   Naoya   who     what    bar    drank Q    even.now remember Q[+WH]
```

Since the PFR applies at the matrix clause, no pitch reset is expected. The grid representation captures this appropriately.

(134)   b′.
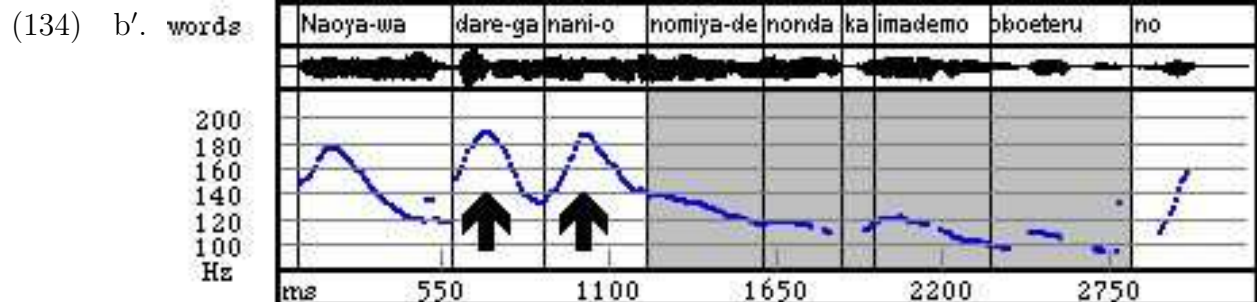
Deriving (134c)

(134c) is a case of an embedded FIP. A FOCUS feature is first assigned to the second *wh*-phrase *nani-o* 'what-ACC' at the embedded cycle, while the first *wh*-phrase *dare-ga* 'who-NOM' receives its FOCUS feature at the matrix cycle. This derivation is exactly the same

as the configuration we discussed in the experiment in Ch. 4 (see (85) in §5.3 or (98C) in the experiment stimuli.) The only difference here is that the first *wh*-phrase belongs to the embedded clause in this example, while it belongs to the matrix clause in the experiment.

(142)   *Grid for (134c)*

   a.   *Embedded Spell-Out cycle*

```
Line 3 |             ×
Line 2 |    ×    ×        [×]  [×]
Line 1 |    ×    ×         ×    ×
       [ dáre nániFOC nomíya nónda ka ]
         who  what    bar    drank Q[+WH]
```

   b.   *Matrix Spell-Out cycle*

```
Line 4 |              ×
Line 3 |              ×      [×]
Line 2 |    ×    ×    ×                ×          ×
Line 1 |    ×    ×    ×    ×    ×      ×          ×
       [ Náoya [ dáreFOC náni nomíya nónda ka ] ímademo obóeteru  no? ]
         Naoya  who     what bar    drank Q    even.now remember Q[+WH]
```

The embedded FIP is not clearly seen in (134c′) (i.e., no clear P-focalization of the second *wh*-phrase, PFR, and pitch reset). The existence of the embedded FIP, however, is attested in Ch. 4. As discussed in §4.3.3 and §5.5.2, it is predicted that the embedded FIPs are more subtle compared to the non-embedded ones. The amount of P-focalization, as well as the pitch reset, is predicted to be smaller. Given that, it is possible that they are not easily recognizable. Therefore I assume the grid representation above is the right representation for (134c′).[4]

(134)   c″.

---

[4]As an alternative possibility, it may be the case that the pitch contour in (134c′) in fact does not contain the embedded FIP. Such a contour involves the discourse givenness. We will discuss the effect of givenness in the next section §6.2.
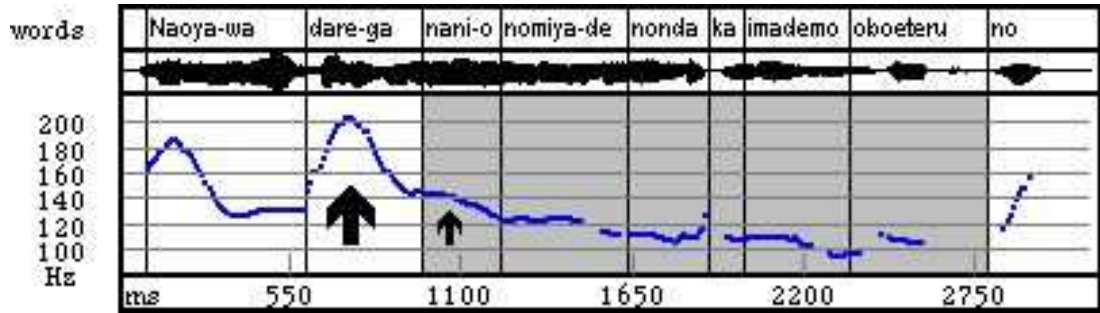
6.1.3 Relative Prominence Constraint

Now let us turn to the question why (134d) is unacceptable. Let us apply our analysis to the unacceptable (134d) case to see what the predicted pitch contour would look like. At the embedded Spell-Out cycle, *dare-ga* is P-focalized, and the PFR applies to all that follows it. At the matrix clause, the second *wh*-phrase *nani-o* is P-focalized, projecting its grid up to Line 4. The PFR apply to Line 3 of the post-FOCUS material. Since there is no × on Line 3 in this case, the PFR does not affect the grid representation. (Note that the PFR Rule does not apply to the second *wh*-phrase *nani-o* in (143b), due to the Continuous Column Constraint (82). See §4.2.7 for relevant discussion.)

(143)   *Grid for (134d)*

    a.   *Embedded Spell-Out cycle*

```
Line 3 |  ×
Line 2 |  ×        [×]      [×]  [×]
Line 1 |  ×         ×        ×    ×
       | [ dáre_FOC náni nomíya nónda ka ]
       |   who      what bar    drank  Q_[+WH]
```

    b.   *Matrix Spell-Out cycle*

```
Line 4 |                 ×
Line 3 |           ×     ×
Line 2 |  ×        ×     ×                    ×           ×
Line 1 |  ×        ×     ×        ×     ×     ×           ×
       | [ Náoya [ dáre náni_FOC nomíya nónda ka ] ímademo obóeteru  no? ]
       |   Naoya   who  what     bar    drank  Q    even.now remember  Q_[+WH]
```

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From this representation we predict that the second *wh*-phrase bears the highest prominence, while the first *wh*-phrase also maintains its prominence (which is smaller relative to the second *wh*-phrase). Our analysis does not exclude such a representation. If we consider the function of FIP, however, we could explain why this derivation should not be available from a prosodic point of view.

The function of FIP is to phonetically indicate the semantic information of contrastive FOCUS. This is done by assigning a prominence to the FOCUS phrase and making the post-FOCUS material less prominent. The FIP Rules proposed in §4.1.1 have been doing this job well so far: In all the examples we have seen so far, the P-focalized phrase is always more prominent than the post-FOCUS material. It is possible to consider that there is a general requirement that any FOCUS phrase be phonetically marked by an FIP, more specifically, be realized more prominently than the post-FOCUS material. The FIP Rules are applied in order for a sentence to satisfy this requirement.

If we look at (143), however, this requirement is not satisfied at the final output, even though the FIP Rules have applied appropriately. The first *wh*-phrase *dare-ga* 'who-NOM' is assigned a prominence at the embedded clause, and all the following phrases, including the second *wh*-phrase *nani-o*, become less prominent due to the PFR. Accordingly, *wh*-phrase *dare-ga* is more prominent than *nani-o* at the embedded cycle. At this point, the general requirement that the FOCUS phrase be more prominent than post-FOCUS phrases is appropriately satisfied.

This requirement, however, is no longer satisfied in the final output, as the second *wh*-phrase *nani-o* 'what-ACC' is P-focalized at the matrix cycle. The first *wh*-phrase *dare-ga* is no longer more prominent than a post-FOCUS phrase *nani-o*. In fact, from the grid representation (143b), we even predict that the second *wh*-phrase is more prominent than the first *wh*-phrase.

I propose that this broken prominence relation makes the sentence unacceptable. I claim that prominence relations for FIP must be maintained throughout the derivation so that they are realized appropriately in the final output. In particular, I propose the following

constraints on the realization of FIP, which we will call the *Relative Prominence Constraint*.

(144) *Relative Prominence Constraint (RPC)*

If α is assigned a FOCUS feature and precedes a non-FOCUS-bearing phrase β in a Spell-Out domain D, then prominence relation

$\alpha > \beta$

must be satisfied.

Let us look at the crossing configuration (134d), repeated below.

(134d) *1st* wh-*phrase* who *bound by* Q_{emb}, *2nd* wh-*phrase* what *bound by* Q_{mat}

* [... [who ... what ... Q_{emb}] ... Q_{mat}]

'For which drink y, does Naoya still remember [for which person x, x drank y at the bar]?'

At the embedded clause, the first *wh*-phrase *dare-ga* 'who-NOM' is assigned a FOCUS feature by the embedded Q-particle, as shown in (145).

(145) *Embedded cycle: FOCUS assigned to the 1st* wh-*phrase* dare-ga

[**dáre**$_{FOC}$-ga **náni**-o   nomíya-de nónda **ka**]
who-NOM   what-ACC bar-LOC   drank Q

Note that the second *wh*-phrase, *nani-o*, has not been assigned a FOCUS feature yet. Accordingly, it is treated as a non-FOCUS-bearing phrase at this Spell-Out cycle.

At this point, a list of prominence relations is created, according to the Relative Prominence Constraint, as in (146).

(146) *Required Prominence Relations (Embedded cycle)*

a. *dare-ga > nani-o*

b. *dare-ga > nomiya-de*

c. *dare-ga > nonda*

Although FOCUS features are deleted after the FIP Rules apply to them (as we have assumed in §4.2.4), the prominence relations between FOCUS phrases and post-FOCUS phrases will be stored in the list. These prominence relations must be satisfied throughout the derivation, to satisfy the Relative Prominence Constraint.

At the embedded cycle, the prominence relations in (146) are appropriately expressed in the grid representation, as in (143a), repeated here:

(143a)   *Grid for (134d) (Embedded cycle)*

Line 3	×			
Line 2	×			
Line 1	×	×	×	×

[**dáre**$_{\text{FOC}}$ **náni** nomíya nónda **ka**]
who   what bar   drank Q$_{[+\text{WH}]}$

At the matrix cycle, the second *wh*-phrase *nani-o* is assigned a FOCUS feature, and hence P-focalized. Accordingly, we obtain the following prominence relation requirements.

(147)   *Matrix cycle: FOCUS assigned to the 2nd* wh-*phrase* nani-o

Náoya-wa   [**dáre**-ga   **náni**$_{\text{FOC}}$-o nomíya-de nónda **ka**] ímademo obóeteru   **no**?
Naoya-TOP   who-NOM what-ACC bar-LOC   drank Q   even.now remember Q

(148)   *Required Prominence Relations (Matrix cycle)*

a.   *nani-o > nomiya-de*

b.   *nani-o > nonda*

c.   *nani-o > imademo*

d.   *nani-o > omotteru*

The grid for the matrix Spell-Out cycle (143b) appropriately represents the prominence relations in (148).

(143b)   *Grid for (134d) (Matrix cycle)*

```
Line 4 |                ×
Line 3 |          ×     ×
Line 2 |    ×     ×     ×              ×           ×
Line 1 |    ×     ×     ×        ×    ×    ×           ×
       [ Náoya [ dáre náni_FOC nomíya nónda ka ] ímademo obóeteru  no? ]
         Naoya  who  what      bar    drank Q    even.now remember Q_[+WH]
```

At this point, however, one of the prominence relations created at the embedded cycle, namely (146a), no longer holds. *dare-ga* is no longer more prominent than *nani-o* in (143b). This prominence relation is destroyed by the P-focalization of the second *wh*-phrase at the later Spell-Out cycle. This broken prominence relation eventually violates the Relative Prominence Constraint. This violation makes the sentence unacceptable.[5]

Such a conflict does not arise in the case of the nesting configuration. Let us look at the grid for (134c) again. At the embedded clause of (134c), the following prominence relations are obtained.

(142a)   *Grid for (134c) (Embedded cycle)*

```
Line 3 |          ×
Line 2 |    ×     ×
Line 1 |    ×     ×         ×      ×
       [ dáre náni_FOC nomíya nónda ka ]
         who  what     bar    drank Q_[+WH]
```

(149)   *Prominence Relations (Embedded cycle)*

a.   *nani-o > nomiya-de*

b.   *nani-o > nonda*

None of these prominence relations are violated even when another FIP is created at the matrix clause.

---

[5]This analysis is again similar to that of Fox and Pesetsky (2003), in which the precedence relations are calculated at each Spell-Out domain, and they are accumulated in the list as the derivation continues. These precedence relations will function as constraints on the possible word order. See fn. 3.

(142b)   *Grid for (134c) (Matrix cycle)*

Line 4		×					
Line 3		×					
Line 2	×	×	×			×	×
Line 1	×	×	×	× ×		×	×

[Náoya [**dáre**_{FOC} **náni** nomíya nónda **ka**] ímademo obóeteru **no**?]
Naoya who what bar drank Q even.now remember Q$_{[+WH]}$

Furthermore, the prominence relations created at the matrix clause do not cause any conflicts either.

(150)   *Prominence Relations (Matrix cycle)*

a. *dare-ga > nani-o*

b. *dare-ga > nomiya-de*

c. *dare-ga > nonda*

d. *dare-ga > imademo*

e. *dare-ga > oboeteru*

In the nesting configuration, the prominence relations between the two *wh*-phrases does not create a conflict with any other relation. In fact, we can clearly see from the grid representation that the following transitive prominence relations can be formed:

dare-ga > nani-o > nomiya-de

This is due to the order in which the prominence is assigned to the *wh*-phrases. In general, in a nesting configuration, the prominence is first assigned to the rightmost *wh*-phrase, and then assigned to those on the left. This entails that phrases P-focalized in the embedded cycle are always contained in the post-FOCUS domain of the phrases P-focalized in a later cycle. This is not the case in the crossing configuration, where the prominence for the second *wh*-phrase is assigned *after* the prominence is assigned to the first *wh*-phrase.

The FIP Rules proposed earlier can be considered as the mechanism that produces a pitch contour that satisfies the Relative Prominence Constraint. In the case of the crossing

configuration, however, the cyclic application of these rules ends up with a derivation that does not satisfy the constraint. In such a case, the Relative Prominence Constraint blocks such an illicit derivation.

This prosodic explanation of the unavailability of the crossing configuration (134d) has some advantages over syntactic ones. First, it can naturally explain the relevance of the surface linear order of the *wh*-phrases, instead of the hierarchical structure, which Saito (1982, 1987, 1994) pointed out. The importance of linear order is trivial if this derivation is blocked by a prosodic factor such as prominence relation, which is defined in terms of pitch prominence and linear order. Also, by proposing the prosodic account for this phenomenon, we need not postulate any further syntactic constraints.

Before closing the discussion, it is worth pointing out that the second *wh*-phrase in multiple *wh*-question sentences (e.g., (134a) and (134b)) is exempt from the Relative Prominence Constraint. As stated in (144), only the non-FOCUS-bearing phrases enter into a prominence relation with the FOCUS-phrase. The second *wh*-phrases in multiple *wh*-questions are FOCUS-bearing phrases. Therefore, they do not enter into prominence relations with the first *wh*-phrase. Thanks to this exemption, there maybe two prominent peaks in a single Spell-Out cycle. If there were no exemption, the second prominence would violate the Relative Prominence Constraint. We would wrongly predict that the pitch contours that we have observed in the multiple *wh*-questions, as in (36a) in Ch. 3, are unacceptable.

Crucially, however, in the nesting and the crossing configuration (i.e., (134c) and (134d)), the second *wh*-phrase is *not* exempt from the constraint. This is because at the point where the first *wh*-phrase is assigned a FOCUS feature and P-focalized, the second *wh*-phrase either (1) has already been assigned a FOCUS feature at the previous cycle and the FOCUS feature is deleted by the application of the FIP Rules; or (2) has yet to be assigned one at the later Spell-Out cycle. This means that the second *wh*-phrase is treated as a non-FOCUS-bearing phrase at the Spell-Out cycle at which the first *wh*-phrase is P-focalized. The difference between the multiple *wh*-questions (in which the two *wh*-phrases have the same scope) and the nesting/crossing configurations (in which they have different scopes) is derived from the

timing of the FOCUS-assignment by Q-particle and the subsequent FIP Rule application.

In the next section, we will examine certain exceptional cases where the Relative Prominence Constraint is apparently violated. We will discuss these cases in relation to the effect of givenness, which we discussed briefly in §2.3.4. Once we account for these exceptional cases, the existence of such exceptions will support our prosodic approach to the crossing configuration, because a syntactic account would not allow such exceptions.

6.2 Multiple WH-Q dependency and Givenness

In the previous section, we discussed the nesting-crossing asymmetry in multiple WH-Q dependency sentences, which has been already reported by researchers (Saito, 1982, 1987, 1994; Kurata, 1991; Shimoyama, 2001). I proposed that the Relative Prominence Constraint blocks the crossing configuration. In this section it will be shown that the crossing configuration becomes available if a context is appropriately provided. I will claim that this fact has to do with the prosodic effect of givenness, which we have briefly discussed in §2.3.4. I propose that contextually given WH-Q dependencies do not create FIP, and hence, are exempt from the Relative Prominence Constraint.

Let us look at (151). This sentence is a multiple WH-Q dependency sentence. This sentence is supposed to be syntactically four-way ambiguous, but only three readings are actually available. The reading that requires the crossing configuration (152d) should not be available, due to the Relative Prominence Constraint.

(151) ∅ [**dáre**-ga **náni**-o nónda **ka**] obóeteru **no**?
        who-NOM wine-ACC drank Q   remember Q

(152) *Readings for (151)*

    a. *Multiple indirect* wh-*question*

        'Do you remember who drank what?'

    b. *Multiple matrix* wh-*question*

        † 'For which person x, for which drink y, do you remember whether x drank y?'

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c. *Nesting Configuration*

† 'For which person x, do you remember what$_j$ x drank t_j ?'

d. *Crossing Configuration*

* 'For which drink y, do you remember who drank y?'

The reading in (152d), however, appears to be naturally available in the following dialog.

(153)   a.   Naoya: [**dáre**-ga   bíiru-o   nónda **ka**] obóeteru?
                  who-NOM beer-ACC drank Q   remember

'Do you remember who drank beer?'

b.   Mari: [**dáre**-ga   BÍIRU-o nónda **ka**]-wa   obóete-nai.
                  who-NOM beer-ACC drank Q   -TOP remember–NEG

'I don't remember who drank BEER.'

c.   Naoya: [**dáre**-ga   **NÁNI**-o nónda **ka**]-wa   obóeteru **no**?
                  who-NOM what-ACC drank Q   -TOP remember

'What$_i$ do you remember who drank t_i ?'

d.   Mari: [**dáre**-ga   WÁIN-o nónda **ka**]-wa   obóeteru yo.
                  who-NOM wine-ACC drank Q   -TOP remember

'I remember who drank WINE.'

In all the utterances in this dialog, there is a WH-Q dependency in the embedded clause, namely, the indirect *wh*-question of the form [*dare-ga x-o nonda ka*] 'who drank x'. In addition, the phrases in CAP need to be P-focalized in order for the utterances to be felicitous. In Mari's first utterance (153b), she P-focalizes *biiru-o* 'beer-ACC', implying that she remembers who drank something other than beer. In response to this utterance, Naoya asks in (153c) what is the drink x such that Mari remembers who drank x. Mari answers the question in (153d) by replacing the *wh*-phrase *nani-o* with *wain-o* 'wine-ACC'. These P-focalized phrases in (153b)–(153d) are located in the post-FOCUS domain of the *wh*-phrase *dare-ga*. Such a derivation is supposed to be blocked by the Relative Prominence Constraint proposed above. Or rather, these sentences are supposed to be unacceptable in the first place, given their crossing configurations.

I claim that these cases involve the prosodic effect of givenness. Recall here that Sugahara (2003) discussed the effect of givenness on the realization of intonation (see also Bader, 2001). In general, contextually given material is realized lower than new material. In (153b) through (153d) above, all the phrases but the P-focalized material is contextually given, due to the previous utterance (153a).

We adopted in this thesis a distinction between contrastive FOCUS and presentational *focus* (Selkirk, 2002, 2003) (§2.2, §2.3.4). The former creates FIPs, while the latter denotes contextually new material. Selkirk (2003) further suggests that "the phonological properties of big, contrastive FOCUS are either a superset of those of small, presentational, *Focus*, or, if different, then are characteristic of a higher level of prominence than those of small *focus* (*Italics* added by S.I.)." She calls this prediction *big focus-small focus containment.* If we assume that FOCUS material is a superset of *focus* material, it means that contextually given (i.e., non-*focus*) material never bears FOCUS. In (153b), for example, the *wh*-phrase *dare-ga* is contextually given, hence does not bear the presentational *focus*, which in turn entails that it does not bear FOCUS either. The same is true for the *dare-ga* in (153c) and (153d) as well. If so, the embedded WH-Q dependency in these utterances is not accompanied with an FIP: If the *wh*-phrase does not bear FOCUS, the FIP Rules do no apply at the embedded Spell-Out cycle. Then, the Relative Prominence Constraint does not apply to the embedded WH-Q dependency. Consequently, the sentences have no violation of this constraint, and therefore, are predicted to be perfectly acceptable sentences, which is in fact the case.

If we try to account for the nesting-crossing dependency asymmetry by postulating certain syntactic constraints, we would need an additional mechanism to allow sentences in (153), because there is no difference between the sentences we discussed in §6.1 and those in (153) in terms of the syntactic configuration.

6.3   Ch. 6: Summary

In this chapter, we discussed the nesting-crossing asymmetry. I proposed that the crossing configuration is unacceptable because it violates the *Relative Prominence Constraint* (144).

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This means that the crossing configuration is only prosodically anomalous. It is syntactically a grammatical configuration. In fact, this configuration may be appropriately used when the Relative Prominence Constraint does not apply to this configuration.

Such a case is observed when the embedded WH-Q dependency is contextually given. Contextually given material, which lacks *focus*, never bears *FOCUS* under the *big focus-small focus containment* suggested by Selkirk (2003). The prosodic effect of givenness sometimes exempt the otherwise illicit crossing configurations.

Chapter 7

Conclusion

In this thesis, we discussed the mechanism of FIP in Japanese. I claimed that FIPs in Japanese are created by the FIP Rules, which manipulate prominence relations between a FOCUS phrase and post-FOCUS phrases. Furthermore, Multiple Spell-Out in syntax enables the cyclic application of the FIP Rules in PF. Thanks to this property, the proposed FIP formation mechanism can derive various types of FIPs that are empirically attested, e.g., a partial FIP in an indirect *wh*-question, an FIP embedded into another FIP, etc. I also proposed a more general constraint on the realization of FIP that blocks derivation with an illicit pronunciation. In this conclusion, we review the important rules and constraints proposed in this thesis.

First, I proposed the *FIP Rules*, a pair of phonological rules that manipulates the prominence relations between the FOCUS phrase and post-FOCUS phrases.

(154) *FIP Rules* (§4.1.1)

    a. *P-focalization Rule* (ex. (45))

        If α_{FOC} bears FOCUS, Add ×'s to α_{FOC} until a new line is formed.

    b. *Post-FOCUS Reduction (PFR) Rule* (ex. (47))

        If α_{FOC} bears FOCUS and precedes β, and α_{FOC}'s peak (after P-focalization) is at Line n, then delete an × of β on Line $n-1$.

Furthermore, I proposed in §4.2.4 that the FIP Rules apply cyclically to relevant Spell-Out domains. With the assumptions about FOCUS-assignment/deletion ((64) and (66), respectively), the FIP Rules apply to a Spell-Out domain when it contains a FOCUS.

(155)   *FIP Rule Application* (§4.2.4, ex. (65))

The FIP Rules apply to a Spell-Out domain if it contains a FOCUS.

As we have seen, this mechanism correctly create the FIPs in various *wh*-constructions, including indirect *wh*-questions, multiple *wh*-questions, embedding FIPs in the multiple WH-Q dependency sentences, etc.. It also derives the FIP-*Wh*-Scope Correspondence (§3.2, (32)).

In Ch. 6, I proposed the *Relative Prominence Constraint*, defined as follows:

(156)   *Relative Prominence Constraints (RPC)* (§6.1.3, ex. (144))

If α is assigned a FOCUS feature and precedes a non-FOCUS-bearing phrase β in a Spell-Out domain D, then prominence relation

$\alpha > \beta$

must be satisfied.

This constraint is proposed to block the crossing configuration (134d), which has been reported to be unacceptable. This constraint also serves for a more general purpose. It ensures that the semantic information of FOCUS is appropriately realized phonetically by maintaining a prominence relation between semantically focalized phrase and the post-focus material. The RPC is therefore responsible for creating a pitch contour that appropriately represents prominence relations between FOCUS and post-FOCUS material, as well as for blocking an illicit pitch contour.

Appendix A

Experiment Stimuli

A.1 FIP Embedding Experiment (Ch. 5)

A.1.1 *Nomiya* Set

(11a) Náoya-wa [Mári-ga **náni**-o nomíya-de nónda **ka**] ímademo obóeteru
Naoya-TOP Mari-NOM what-ACC bar-LOC drank Q even.now remember

'Naoya still remembers what$_i$ Mari drank t_i at the bar.'

(11b) Náoya-wa [Mári-ga **nánika**-o nomíya-de nónda **ka**] ímademo obóeteru
Naoya-TOP Mari-NOM something-ACC bar-LOC drank Q even.now remember

'Naoya still remembers whether Mari drank something at the bar.'

(11c) **dáre**-ga [Mári-ga **náni**-o nomíya-de nónda **ka**] ímademo obóeteru **no**?
who-NOM Mari-NOM what-ACC bar-LOC drank Q even.now remember Q

'Who still remembers what$_i$ Mari drank t_i at the bar?'

(11d) **dáre**-ga [Mári-ga **nánika**-o nomíya-de nónda **ka**] ímademo obóeteru
who-NOM Mari-NOM something-ACC bar-LOC drank Q even.now remember
no?
Q

'Who still remembers whether Mari drank something at the bar?'

A.1.2   Roommate Set

(21a)   Náoya-wa   [Mári-ga   **dáre**-o   ruumuméito-ni eránda **ka**] Yúuzi-ni tazúneta
Naoya-TOP   Mari-NOM who-ACC roommate-DAT chose   Q   Yuji-DAT asked

'Naoya asked Yuji who$_i$ Mari chose t_i as her roommate.'

(21b)   Náoya-wa   [Mári-ga   **dáreka**-o   ruumuméito-ni eránda **ka**] Yúuzi-ni
Naoya-TOP   Mari-NOM someone-ACC roommate-DAT chose   Q   Yuji-DAT
tazúneta
asked

'Naoya asked Yuji whether Mari chose someone as her roommate.'

(21c)   **dáre**-ga   [Mári-ga   **dáre**-o   ruumuméito-ni eránda **ka**] Yúuzi-ni tazúneta **no**?
who-NOM   Mari-NOM who-ACC roommate-DAT chose   Q   Yuji-DAT asked   Q

'Who asked Yuji who$_i$ Mari chose t_i as her roommate?'

(21d)   **dáre**-ga   [Mári-ga   **dáreka**-o   ruumuméito-ni eránda **ka**] Yúuzi-ni tazúneta
who-NOM   Mari-NOM someone-ACC roommate-DAT chose   Q   Yuji-DAT asked
no?
Q

'Who asked Yuji whether Mari chose someone as her roommate?'

A.1.3   *Erimaki* Set

(31a)   Mári-wa   [**dáre**-ga Náoya-ni   erímaki-o ánda   **ka**] Yúuko-ni morásita
Mari-TOP   who-NOM Naoya-DAT scarf-ACC knitted Q   Yuko-DAT divulged

'Mari divulged to Yuko who knitted a scarf for Naoya.'

(31b)   Mári-wa   [**dáreka**-ga   Náoya-ni   erímaki-o ánda   **ka**] Yúuko-ni morásita
Mari-TOP   someone-NOM Naoya-DAT scarf-ACC knitted Q   Yuko-DAT divulged

'Mari divulged to Yuko whether someone knitted a scarf for Naoya.'

(31c)   **dáre**-ga   [**dáre**-ga Náoya-ni   erímaki-o ánda   **ka**] Yúuko-ni morásita **no**?
who-NOM   who-NOM Naoya-DAT scarf-ACC knitted Q   Yuko-DAT divulged Q

'Who divulged to Yuko who knitted a scarf for Naoya?'

(31d)   **dáre**-ga   [**dáreka**-ga   Náoya-ni   erímaki-o ánda   **ka**] Yúuko-ni morásita
who-NOM   someone-NOM Naoya-DAT scarf-ACC knitted Q   Yuko-DAT divulged
no?
Q

'Who divulged to Yuko whether someone knitted a scarf for Naoya?'

A.1.4 Boston Set

(41a) áru razió-kyoku-ga   [Bósuton-de **ítu** áme-ga   fúru **ka**]
some radio-station-NOM   Boston-LOC when rain-NOM fall   Q
tenki-yóhoo-de   tutaeta
weather-forecast-LOC reported

'Some radio station reported in the weather forecast when it will rain in Boston.'

(41b) áru razió-kyoku-ga   [Bósuton-de **ítuka**   áme-ga   fúru **ka**]
some radio-station-NOM   Boston-LOC sometime rain-NOM fall   Q
tenki-yóhoo-de   tutaeta
weather-forecast-LOC reported

'Some radio station reported in the weather forecast weather it will rain sometime in

Boston.'

(41c) **dóno** razió-kyoku-ga   [Bósuton-de **ítu** áme-ga   fúru **ka**]
which radio-station-NOM   Boston-LOC when rain-NOM fall   Q
tenki-yóhoo-de   tutaeta **no**?
weather-forecast-LOC reported Q

'Which radio station reported in the weather forecast when it will rain in Boston?'

(41d) **dóno** razió-kyoku-ga   [Bósuton-de **ítuka**   áme-ga   fúru **ka**]
which radio-station-NOM   Boston-LOC sometime rain-NOM fall   Q
tenki-yóhoo-de   tutaeta **no**?
weather-forecast-LOC reported Q

'Which radio station reported in the weather forecast weather it will rain sometime

in Boston?'

A.1.5 *Aisiteru* Set

(51a) Yúmi-wa [Yúuzi-ga **dáre**-o nánnen-mo áisiteru **ka**] Mári-ni morásita
Yumi-TOP Yuji-NOM who-ACC many.years love Q Mari-DAT divulged

'Yumi divulged to Mari who$_i$ Yuji loves t_i for many years.'

(51b) Yúmi-wa [Yúuzi-ga **dáreka**-o nánnen-mo áisiteru **ka**] Mári-ni morásita
Yumi-TOP Yuji-NOM someone-ACC many.years love Q Mari-DAT divulged

'Yumi divulged to Mari whether Yuji loves someone for many years.'

(51c) **dáre**-ga [Yúuzi-ga **dáre**-o nánnen-mo áisiteru **ka**] Mári-ni morásita **no**?
who-NOM Yuji-NOM who-ACC many.years love Q Mari-DAT divulged Q

'Who divulged to Mari who$_i$ Yuji loves t_i for many years?'

(51d) **dáre**-ga [Yúuzi-ga **dáreka**-o nánnen-mo áisiteru **ka**] Mári-ni morásita
who-NOM Yuji-NOM someone-ACC many.years love Q Mari-DAT divulged
no?
Q

'Who divulged to Mari whether Yuji loves someone for many years?'

A.1.6 *Maneita* Set

(61a) Yúuzi-wa [**dáre**-ga Náoya-o ié-ni manéita **ka**] Yúuko-ni morásita
Yuji-TOP who-NOM Naoya-ACC house-DAT invited Q Yuji-DAT divulged

'Yuji divulged to Yumi who invited Naoya to his/her house.'

(61b) Yúuzi-wa [**dáreka**-ga Náoya-o ié-ni manéita **ka**] Yúuko-ni morásita
Yuji-TOP someone-NOM Naoya-ACC house-DAT invited Q Yuji-DAT divulged

'Yuji divulged to Yumi whether someone invited Naoya to his/her house.'

(61c) **dáre**-ga [**dáre**-ga Náoya-o ié-ni manéita **ka**] Yúuko-ni morásita **no**?
who-NOM who-NOM Naoya-ACC house-DAT invited Q Yuji-DAT divulged Q

'Who divulged to Yumi who invited Naoya to his/her house?'

(61d) **dáre**-ga [**dáreka**-ga Náoya-o ié-ni manéita **ka**] Yúuko-ni morásita
who-NOM someone-NOM Naoya-ACC house-DAT invited Q Yuji-DAT divulged
no?
Q

'Who divulged to Yumi whether someone invited Naoya to his/her house?'

A.1.7 *Ookina mi* Set

(71a) Náoya-wa   [**dáre**-no kí-ni   óokina mi-ga   nátta   **ka**] nobotte
      Naoya-TOP   who-GEN tree-LOC big   fruit-NOM be.borne Q   by.climbing
      tasikámeta
      checked

      'Naoya checked whose tree bore a big fruit by climbing.'

(71b) Náoya-wa   [**dáreka**-no   kí-ni   óokina mi-ga   nátta   **ka**] nobotte
      Naoya-TOP   someone-GEN tree-LOC big   fruit-NOM be.borne Q   by.climbing
      tasikámeta
      checked

      'Naoya checked whether someone's tree bore a big fruit by climbing.'

(71c) **dáre**-ga   [**dáre**-no kí-ni   óokina mi-ga   nátta   **ka**] nobotte
      who-NOM   who-GEN tree-LOC big   fruit-NOM be.borne Q   by.climbing
      tasikámeta **no**?
      checked   Q

      'Who checked whose tree bore a big fruit by climbing?'

(71d) **dáre**-ga   [**dáreka**-no   kí-ni   óokina mi-ga   nátta   **ka**] nobotte
      who-NOM   someone-GEN tree-LOC big   fruit-NOM be.borne Q   by.climbing
      tasikámeta **no**?
      checked   Q

      'Who checked whether someone's tree bore a big fruit by climbing?'

A.1.8 *Nomo* Set

(81a) áru nyúusu-ga [Nómo-ga **dáre**-ni nákkuru-o   nágeta **ka**] óokiku
  some news-NOM   Nomo-NOM who-DAT knuckleball-ACC pitched Q   widely
  hoozita
  broadcasted

  'Some news program widely broadcasted to whom$_i$ Nomo pitched a knuckleball.'

(81b) áru nyúusu-ga [Nómo-ga **dáreka**-ni   nákkuru-o   nágeta **ka**] óokiku
  some news-NOM   Nomo-ga someone-DAT knuckleball-ACC pitched Q   widely
  hoozita
  broadcasted

  'Some news program widely broadcasted whether Nomo pitched a knuckleball to someone.'

(81c) **dóno** nyúusu-ga [Nómo-ga **dáre**-ni nákkuru-o   nágeta **ka**] óokiku
  which news-NOM   Nomo-NOM who-DAT knuckleball-ACC pitched Q   widely
  hoozita   **no**?
  broadcasted Q

  'Which news program widely broadcasted to whom$_i$ Nomo pitched a knuckleball?'

(81d) **dóno** nyúusu-ga [Nómo-ga **dáreka**-ni   nákkuru-o   nágeta **ka**] óokiku
  which news-NOM   Nomo-NOM someone-DAT knuckleball-ACC pitched Q   widely
  hoozita   **no**?
  broadcasted Q

  'Which news program widely broadcasted whether Nomo pitched a knuckleball to someone?'

A.2 Multiple *Wh*-question Experiment (§3.3.1)

A.2.1 *Nomiya* Set

(15c) **dáre**-ga ano yóru **náni**-o nomíya-de nónda **no**?
who-NOM that night what-ACC bar-LOC drank Q

'Who drank what at the bar that night?'

(15d) Náoya-wa ano yóru **náni**-o nomíya-de nónda **no**?
Naoya-TOP that night what-ACC bar-LOC drank Q

'What did Naoya drink at the bar that night?'

A.2.2 Roommate Set

(25c) **dáre**-ga ryóo-de **dáre**-o ruumuméito-ni eránda **no**?
who-NOM dorm-LOC who-ACC roommate-DAT chose Q

'Who chose who as his/her roommate at the dorm?'

(25d) Mári-wa ryóo-de **dáre**-o ruumuméito-ni eránda **no**?
Mari-TOP dorm-LOC who-ACC roommate-DAT chose Q

'Who$_i$ did Mari choose t_i as her roommate at the dorm?'

A.2.3 *Erimaki* Set

(35c) **dáre**-ga Náoya-ni **náni**-o ánda **no**?
who-NOM Naoya-DAT what-ACC knitted Q

'Who knitted what for Naoya?'

(35d) Mári-wa Náoya-ni **náni**-o ánda **no**?
Mari-TOP Naoya-DAT what-ACC knitted Q

'What$_i$ did Mari knit t_i for Naoya?'

A.2.4 Boston Set

Not used in this experiment

A.2.5 *Aisiteru* Set

(55c) **dáre**-ga Yúuzi-o **nánnen**   áisiteru **no**?
       who-NOM Yuji-ACC how.many.years love   Q

       'Who loves Yuji for how many years?'

(55d) Yúmi-wa Yúuzi-o **nánnen**   áisiteru **no**?
       Yumi-TOP Yuji-ACC how.many.years love   Q

       'How many years$_i$ does Yumi love Yuji t_i?'

A.2.6 *Maneita* Set

(65c) **dáre**-ga ano yóru **dáre**-o ié-ni   manéita **no**?
       who-NOM that night who-ACC house-DAT invited   Q

       'Who invited who to his/her house?'

(65d) Yúuzi-wa ano yóru **dáre**-o ié-ni   manéita **no**?
       Yuji-TOP that night who-ACC house-DAT invited   Q

       'Who$_i$ did Yuji invite t_i to his house?'

A.2.7 *Ookina mi* Set

Not used in this experiment

A.2.8 *Nomo* Set

Not used in this experiment

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