Prosody and Meaning

Interface Explorations 25

Editors

Artemis Alexiadou
T. Alan Hall

Prosody and Meaning

edited by

Gorka Elordieta
Pilar Prieto

De Gruyter Mouton

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Introduction

The present book is a collection of articles that stem from presentations and discussions at the "Workshop on Prosody and Meaning", held on September 17–18, 2009, at one of Catalonia's prime linguistic institutions, the *Institut d'Estudis Catalans*. The Barcelona workshop was co-organized by the editors of this book, and it was part of the activities of the research network *Forms and Functions of Prosodic Structure*, with Carlos Gussenhoven and Yiya Chen as main convenors and Gorka Elordieta, Sónia Frota, Aditi Lahiri, Pilar Prieto, Tomas Riad and Elisabeth Selkirk as coordinators. All of the articles included in the volume present novel contributions to the understanding of important issues in the prosody-meaning interface, such as the relationship between prosody and pragmatic meaning both in oral and sign languages (Wichmann; Herrmann), the production and perception of focus and givenness in declarative sentences and *wh*-questions (Frota; Gili Fivela; Bishop; Truckenbrodt; Baumann & Riester; D'Imperio, German & Michelas; Surányi, Ishihara & Schubö), the patterns of lexicalization or storage of intonational contours (Calhoun & Schweitzer; Bishop), the relevance of sociopragmatics in the interpretation of prosody (Wichmann), and the assessment of methodologies used in the field (Frota; Gili Fivela).

In the last few decades, the study of prosody has concentrated on the analysis of its acoustic form (fundamental frequency and duration patterns), and less is known about its relationship with semantic and pragmatic meaning. In the present book, we attempt to fill this gap by focusing on the relationship between prosody and meaning, from different perspectives. The goal of this book is to bring together contributions by researchers coming from different backgrounds and working on the interface between prosody and meaning. The articles included in the book cover a broad range of methodological approaches to the study of prosody and meaning. Most of the papers devoted to the study of the production and perception of intonational contrasts related to information structure adopt a laboratory phonology methodology (Frota; Gili Fivela; Bishop; D'Imperio et al.; Surányi et al.). The article by Truckenbrodt is based on elicitations of prosodic patterns in controlled contexts, not from a laboratory phonology perspective, and the articles by Baumann and Riester on the one hand and Calhoun and Schweitzer on the other analyse speech corpora. Finally, Wichmann's and Herrmann's respective articles offer a socio-pragmatic analysis of the meaning of prosody in naturally occurring interactive speech in both natural languages and sign languages. An important asset of this collection of

articles is that they include analyses of a wide variety of languages, including Romance languages such as European Portuguese (Frota), Italian (Gili Fivela) and French (D'Imperio et al.), Germanic languages such as English (Bishop; Calhoun & Schweitzer; Wichmann) and German (Baumann & Riester; Truckenbrodt), non-Indoeuropean languages such as Hungarian (Surányi et al.) and sign languages (Herrmann).

The chapter by D'Imperio, German and Michelas constitutes a significant advance in the knowledge of focus prosody in French. In this language, focus is reflected prosodically in terms of phrasing, not in terms of prominence. Focalized constituents are followed by plateaux in a low tone, but focalized constituents themselves are not made more prominent by a boost in F0 level. Earlier work in French prosody has revealed the existence of an intonational rise aligned with the beginning of Accentual Phrases (APs) under certain conditions, such as focus or emphasis, relative length of the AP, or level of syntactic embeddedness. The authors confirm empirically the observation that in French focalized Accentual Phrases tend to start with an initial intonational rise, which has been labelled in earlier proposals as LHi. However, other factors not related to focus such as constituent length play a role in the frequency of occurrence of initial rises, in the sense that longer focalized constituents appear more frequently with initial rises than shorter focalized constituents. The results of an experiment carried out by the authors show that the effects of focus and length are independent and cumulative. That is, the effects of focus are held constant regardless of the size of the constituent, and the effects of size or length are also held constant regardless of whether that constituent is focalized or not. Hence, the authors argue that only a combination of factors pertaining to information structure and prosodic size can account for all the variability in the occurrence of LHi rises in French.

Surányi, Ishihara and Schubö's chapter analyses the prosodic structure of Hungarian in relation to information structure. The results of an experiment carried out by the authors show that the default prosodic phrasing in broad focus sentences is one with a partition between a topic and a comment. In the sentences used in the experiment, the topic included a scene-setting adverbial, expressed as a Prepositional Phrase, and the comment included two quantifier phrases in preverbal position (subject and object, respectively), the verb with a preverbal particle, and a postverbal phrase. The accents in the comment are expressed by a H*L accent in the great majority of cases, and downstep applies in it. The topic presents LH* or H* accents, and is followed by H% or L% boundary tones. The leftmost accent in the comment gets nuclear stress. The syntactic position of the topic is above the syntactic maximal projection TP, and Surányi, Ishihara and Schubö make the proposal that the left edge of TP is

aligned with the left edge of an Intonational Phrase. This default phrasing may be altered when narrow focus is carried by a phrase which would not receive main sentential stress in broad or default contexts, i.e., phrases that are not the first phrase in TP. In order to obey a Stress-Focus correspondence rule that demands that focalized constituents get nuclear stress, speakers may move the first or external phrase in TP to a topic position, so that the following phrase is now the first phrase in the comment and hence gets nuclear stress. Another possible strategy observed for some speakers is to boost the pitch level of the focalized word without altering the topic-comment structure, and finally some speakers may also choose not to highlight that word prosodically at all (i.e., they have a default topic-comment structure and do not make the phrase internal to the comment stand out intonationally).

The chapter by Hubert Truckenbrodt offers a comprehensive analysis of the prosodic properties of German *wh*-questions, developing on the tight connection between the prosodic aspects of *wh*-phrases and their semantic and morphosyntactic focus properties. However, the author intends to construct a model that constitutes a more general theory of the principles ruling the ability of *wh*- phrases to bear an accent and the most prominent stress in the sentence, as evidenced by the extension of the theory to languages other than German. The chapter is divided in two parts. In the first part, the author substantiates by means of controlled question-answer contexts previous claims and observations in the literature on the prosody of German *wh*-questions, such as the fact that moved *wh*-words in single-*wh* questions are by default unaccented, whereas *wh*-words staying in situ in multiple-*wh* questions are by default accented. New claims are also made. First, *wh*-words associated with an indefinite pronoun in the context can only optionally receive main prosodic prominence. That is, such words can be F-marked but they can also be G-marked, given their semantic similarities with indefinite pronouns. Second, embedded questions are de-stressed if the entire question is semantically given, not just parts of it. In the second part, Truckenbrodt provides a theoretical explanation for the generalization that moved *wh*-words in single-*wh* questions are unaccented by default, whereas *wh*-words staying in situ in multiple-*wh* questions are accented by default. He argues that this difference is due to an alternative way of satisfying the grammatical constraint demanding sentential prominence for focused constituents, namely syntactic movement of the *wh*-phrases to Spec,FocP. This proposal finds support in languages with in situ *wh*-questions, such as Japanese and Turkish, where *wh*-phrases do not bear sentential stress.

In their chapter, Stefan Baumann and Arndt Riester make a new proposal for the characterization of the information structure labels 'given' and 'new'

and explore the association of these features with accent assignment. The authors provide a review of the literature on the distinction between these categories of information structure, revealing the shortcomings of the different proposals, and suggest an alternative scheme that establishes a finer-grained typology of the notion 'givenness'. This scheme is based on two levels of 'givenness', a referential and a lexical level, corresponding to referential expressions and non-referential expressions respectively. At each of these levels there is a rich array of types of givenness, based on concepts such as co-reference, bridging, inference, hearer knowledge, indexicality and embeddedness. Baumann and Riester state several hypotheses on the relation between combinations of referential and lexical types of givenness and the assignment of an accent. More concretely, the hypotheses try to establish a correlation between different types of givenness and lack of accent (traditionally known as 'deaccentuation'). These hypotheses are tested against two types of German corpora, one from natural monologues and one from read texts, and although the results show that the hypotheses are supported only partially, the authors point out that at least in read speech a correlation is observed between the degrees of givenness or newness at the referential level and the different percentages of presence of accent. Baumann and Riester conclude that the proposed framework of referential and lexical schemes of givenness seems to be useful in providing a constrained basis for understanding the relationship between degrees of givenness and the likelihood of presence or absence of pitch accents.

Sónia Frota's chapter investigates the production and perception of a well-known intonational contrast in Portuguese, namely, the contrast between the neutral/broad focus statement and the narrow/contrastive focus statement. Previous work on European Portuguese intonation revealed that this intonational contrast is realized by a difference in fundamental frequency alignment in relation to the nuclear accented syllable. The author investigates the categorical nature of the contrast by performing three experiments based on the Categorical Perception paradigm that resort to semantically motivated tasks. The three experiments test whether differences in F0 alignment are responsible for triggering the perceptual change from one meaning to the other. In Experiment 1, listeners had to classify the stimuli (i.e., an alignment continuum ranging from the end of one category to the next) in a context-matching identification task. In Experiment 2, participants rated the appropriateness of stimuli with respect to contextual information in a semantic scaling task. Finally, in Experiment 3, pairs of stimuli were discriminated in a context-matching discrimination task. The results of the three experiments provide converging evidence for the distinction between a broad focus and a narrow

focus accent distinction, which is encoded through alignment properties at the pitch accent level. At the methodological level, the chapter demonstrates the advantages of using a multiple methodology approach that takes into account semantic and contextual features in the study of the perception of intonational meaning.

Barbara Gili Fivela's chapter applies the Perceptual Magnet Effect paradigm to the study of intonation, and specifically, to the contrast between two pitch accents in Pisa Italian. The aim of the investigation was to test (a) whether exemplars of a pitch accent category may be judged differently and can be considered prototypes and non-prototypes for the given pitch accent categories, and (b) whether finding an intonational prototype may be enough for the emergence of a Perceptual Magnet Effect. Previous work by the author on Pisa Italian intonation has revealed an alignment (and scaling) contrast between two target pitch accents in Pisa Italian, namely, an H*+L accent which is related to the meaning of contrastive focus and is realized as an especially high rise-fall pitch accent within the limits of the accented syllable, and a H* accent, which is related to the meaning of continuation or re-introduction of a topic and is realized as a rising pitch accent. Subjects participated in three experiments, namely, an identification experiment, a goodness rating experiment, and a discrimination test. The identification experiment confirmed a two-way categorical distinction in the perceptual space between the two target pitch accents. In the goodness rating experiment, listeners had to rate the stimuli on a 7 point Likert scale in relation to the question "how good is the stimulus in representing X?" The results showed that the best prototypes for both pitch accents were the extreme stimuli. Finally, the results of the discrimination task found a Perceptual Magnet Effect for the correction/opposition category (i.e., reduced discrimination was found for pairs including the prototype of the category in comparison to those including the non-prototype). No Perceptual Magnet Effect was found for the continuation/(re)introduction category. In the discussion, the author attributes these results to the fact that intonation can have other potential meanings that interact with the tested meaning in the specific experimental task. To test this hypothesis, she undertakes a context-matching goodness rating experiment with the same stimuli, which reveals that goodness rates for the H* category (and thus the identification of prototypes) depend on contextual information. This result leads to an interesting methodological and theoretical discussion on the role of context and semantic information on the interpretation of tunes.

Jason Bishop's chapter shows that native speakers have different expectations for the prosodic prominence levels of broad sentence focus, VP focus and object narrow focus. In two perception experiments with native speakers of

American English, previously recorded VP focus utterances were presented to the listeners as responses to questions demanding broad sentence focus, VP focus and narrow focus on the object, and they had to assign prominence ratings to the accents in the subject, the verb and the object in each utterance. The *wh*-questions in Experiment 1 were designed to trigger non-contrastive focus, and those in Experiment 2 were designed to trigger contrastive focus. In both experiments, native listeners assigned higher prominence ratings to the object in all sentences, a result which was expected by the nuclear accent in the object in all cases. But interestingly, the subjects assigned the highest prominence ratings to the objects in the sentences that were presented as responses to a *wh*-question that triggered narrow focus on the object, even though the actual utterances had been produced with VP-focus. In these cases, the higher prominence rating on the object was accompanied by a lower prominence rating on the verb. In other words, in situational contexts of narrow focus on the object the listeners were enhancing the differences in prominence level between the verb and the object, guided by their knowledge of what the prototypical prominence levels in the verb and object usually are in those contexts. Given previous findings in the literature at the segmental level, Bishop suggests that listeners may store extreme or hyperarticulated representations as prototypes or models of prosodic prominence levels in different contexts of focus.

Sasha Calhoun and Antje Schweitzer's chapter deals with the potential lexicalization patterns of lexical-intonation pairings. A number of studies have noted that certain words or phrases, especially discourse markers, are typically paired with particular intonation contours. The chapter presents the results of a corpus study of the Switchboard conversational corpus, in which novel methods were applied to identify similar intonation contours using automatic clustering techniques, as well as collocational analysis to identify common lexical phrases and intonation pairs. A quantitative analysis of the relationship between words (and short phrases) and intonation contours revealed that lexical phrases tend to be paired with different accent type clusters, and that certain frequent exemplars seem to have meanings particular to that intonational collocation, with very specific discourse connotations. Taking on the exemplar-theoretic perspective, Calhoun and Schweitzer claim that utterances are stored with their intonation contours, so that those contours are "lexicalised" if frequent enough. Finally, the chapter presents the results of a perception experiment in which subjects judged the acceptability of different intonation-word patterns. Similarly to lexical collocates, subjects judged frequent word-intonation collocates and low frequency collocates pragmatically related to the frequent ones as more natural than low frequency, unrelated collocates. These results reveal that the frequency-based storage of lexicalised intonation contours forms part of

grammar and crucially affects expectations about intonational realisation and intonational meaning.

There has been little investigation of the role of prosody in the perception of sociopragmatic meaning in conversational speech. Anne Wichmann's chapter assesses the role played by prosodic accommodation in sequential speaker turns as a source of a variety of sociopragmatic meanings in conversational speech. The paper first reviews relevant results in the ethnographic and pragmatics literature about the importance of prosodic accommodation or prosodic alignment in the conveyance of meanings such as compliance, rapport or empathy between speakers. The studies reviewed by the author take spontaneous face-to-face conversations as their main empirical domain of investigation. Many studies underline the role of gestural and prosodic alignment (i.e., tonal and rhythmic alignment) with the interlocutor as a central source of successful interpersonal communication. Similarly, a number of studies have found that prosodic accommodation is motivated and determined by social context, that is, the control of prosodic matching with the interlocutor is closely associated with perceived social status. In general, interlocutors with lower social status tend to accommodate to partners with higher social status. In situations of conflict, studies suggest that prosodic misalignment is a clear signal of the lack of conversational common ground. In sum, Wichmann's chapter convincingly shows that the analysis of pitch and rhythmic convergence in conversation can be a valuable tool to study power and solidarity moves in conversation, as well as to assess successful communicative exchanges. Moreover, Wichmann suggests that the control of prosodic accommodation on the part of the speakers can play a strategically important role in helping increase successful communicative exchanges and at the same time avoiding situations of conflict.

Annika Herrmann's chapter investigates the role of prosody and its meaning in German Sign Language. The chapter starts with a summary of the state of the art concerning prosody in visual sign languages. Most studies agree that prosodic domains and 'intonational tunes' in sign languages are predominantly expressed through the use of nonmanual (and some manual) features: for example, specific nonmanual cues mark *wh*-interrogatives, conditional clauses, as well as relative clauses. The paper goes on to discuss the competing syntactic and prosodic accounts of these nonmanual features, arguing for a compositional prosodic analysis of intonational meaning in sign languages expressed through nonmanual features. The empirical basis of the investigation is comprised by conversations between two German Sign Language signers elicited from two tasks, namely a context creation task ('retelling a story') and a picture story elicitation task. Results from the context creation task show the following: (a) prosodic meaning was primarily conveyed by nonmanuals; and (b)

prosodic meaning can be analyzed by a compositional addition of individual decomposable features and may combine with other nonmanuals to construct complex meanings. For example, nonmanuals for yes-no questions (typically raised eyebrows and a forward head tilt) can combine with frowning to indicate skepticism and disbelief. All in all, Herrmann argues that the data support the view that prosody is a modality-independent universal phenomenon and that the compositional account is especially suitable for the analysis of prosodic meaning in German Sign Language.

A multi-level approach to focus, phrasing and intonation in French

Mariapaola D'Imperio, James German and Amandine Michelas

Abstract

Much recent work on German and English intonation has addressed the impact of information structure on prosodic patterns in terms of the focus/background partition. In contrast with stress-accent languages such as Italian, Spanish or English, French does not appear to signal focus through pitch accent assignment, rather it appears to mainly exploit prosodic edge marking for the same purposes. The fact that prosodic phrasing is highly sensitive to focus structure is not only true for French, but also for pitch accent languages such as Japanese and Basque (see Gussenhoven 2004 for a discussion), as well as for stress-accent languages (Beckman 1986). A previous analysis (Féry 2001) has proposed that French largely exploits phrasing in order to signal focus, and that narrow and contrastive focus "lead to an initial boundary tone, usually high". Here we attempt to build on Féry's insight by showing that, while phrasing is one of the strategies that French adopts in order to signal focus, phrasing cues are different when either the left or the right edge of the focal domain are taken into account. Our findings show that initial LHi rises are associated with the left edge of contrastive focus regions in French, and may therefore serve an important marking function. Crucially, phrase length also contributed to the distribution of LHi, suggesting a probabilistic integration of factors from different levels.

Keywords: contrastive focus, phrasing, French prosody

1. Introduction

Different languages use different methods to signal phrasing, mostly tonal demarcation but also segmental or tonal sandhi rules (cf. Shih 1990 for Chinese), and most of them support the existence of a higher level prosodic unit defined as the Intonation Phrase. This unit is generally understood as corresponding to

a sense unit or a syntactic clause, and in traditional phonetic studies it has been linked to the notion of "breath group". Despite the ongoing debate about French intonation structure, most intonation models of French do generally include a high level of constituency, the Intonation Phrase (Post 2000; Jun and Fougeron 2000, 2002), corresponding to the *intonation unit* of more traditional descriptive work (cf. Di Cristo 2000).

Another basic constituent of the French prosodic hierarchy that is generally agreed upon is a smaller unit, the Accentual Phrase (Jun and Fougeron 1995, 2000, 2002; Welby 2002, 2006), which roughly corresponds to, but does not always overlap with, the Phonological Phrase (see Post 2000; Delais-Roussarie 2005; Astésano et al. 2007). This unit can also be found in non-autosegmental descriptions with different labels, such as the *intonème mineur* (Delattre 1966; Rossi 1985, 1999), the prosodic word (Vaissière 1992), the rhythmic unit (Di Cristo and Hirst 1993) and the accentual group (Mertens 2004). In most intonation descriptions we also find evidence for the existence of at least one smaller prosodic unit, whose domain might correspond either to a Major or a Minor Phonological Phrase (Selkirk 2000), either in the form of an intermediate phrase (Beckman 1986) or of a smaller unit, the Accentual Phrase.

In this paper, we set out to address the complex interaction between initial rise distribution in French and semantic and phrasing factors. Specifically, we argue that the initial rise distribution and its relationship to information structure and syntax is likely to be mediated by an extra level of phrasing, i.e., the intermediate phrase. Through a review of existing proposals and experimental evidence, we further propose that neither a straightforward Focus-to-Accent approach (see Ladd 2008) nor an approach based on phrase edges (e.g. Féry 2001) are able to account for the full range of variability associated with focus marking in French. We begin, however, with a review of some basic notions of prosodic structure in French.

1.1. French prosodic structure: Basic notions

In our approach, we employ the notion of Accentual Phrase (AP) as defined by Jun and Fougeron (1995, 2000), whose underlying tonal structure is a LHiLH* sequence (for a detailed description of AP realizations, see Jun and Fougeron 2002). According to this model, the AP is characterized by two tonal events, which in other frameworks may be referred to as primary and secondary accents (Pasdeloup 1990; Di Cristo 2000). The primary accent is a LH* phrase final accent marked by a noticeable *f0* movement as well as by preboundary lengthening. Moreover, this tonal sequence is associated with the last full syl-
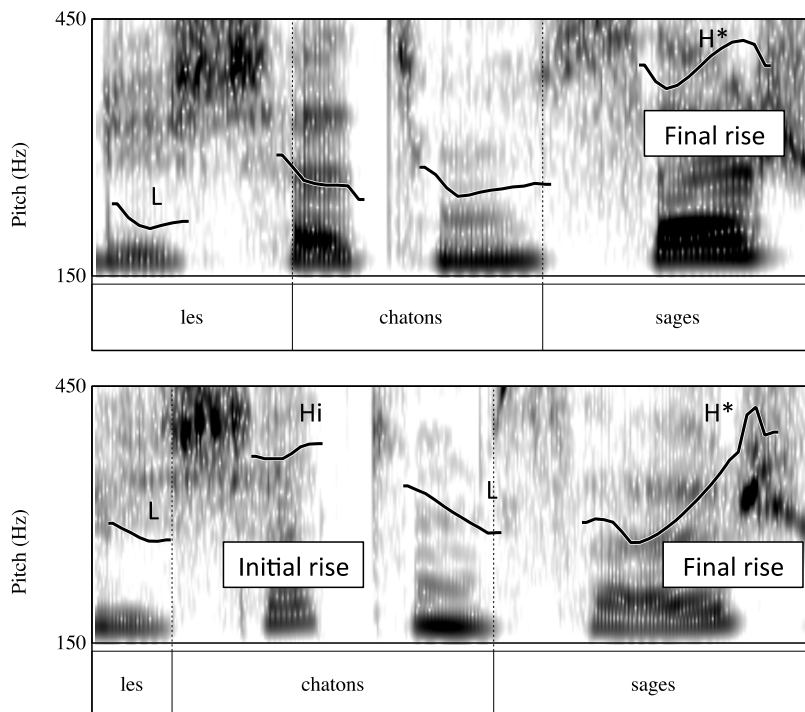
Figure 1. Example of two types of Accentual Phrase for the sequence *les chatons sages* 'the good kittens' realized with either only a final rise (upper) or with an additional/optional early rise (lower). (Excerpt taken from the utterance *Les chatons sages buvaient leur lait* 'The good kittens were drinking their milk' read by a native speaker of French).

lable of the AP. The secondary accent is better defined as an *initial rise* (see AM accounts such as those of Jun and Fougeron 2000; Welby 2002), on the basis of both phonetic and phonological differences between the two tonal rises (see 3.1 below for more detail).

Phonologically, only the final accent corresponds to a unique stress location (Dell 1984); phonetically, rhyme lengthening only occurs within the final accent domain, while never within the initial rise domain (Pasdeloup 1990; Astésano, 2001).

Note that both the initial and final (accentual) rises are important markers of phrasal edges, and the location of such edges appears to interact with focus. The fact that prosodic phrasing is highly sensitive to focus structure is not only true for French, but also for pitch accent languages such as Japanese and Basque

(see Gussenhoven 2004 for a discussion), as well as for stress-accent languages (Beckmann 1986). However, in contrast with stress-accent languages such as Italian, Spanish or English, French does not appear to signal focus through pitch accent assignment, rather it appears to generally exploit prosodic edge marking for the same purposes. For instance, Féry (2001) has proposed that French largely exploits phrasing in order to signal focus, and that narrow and contrastive focus "lead to an initial boundary tone, usually high". Here we shall attempt to build upon Féry's insight by showing that, while phrasing is one of the strategies that French adopts in order to signal focus, phrasing cues are different when either the left or the right edge of the focal domain are taken into account. Specifically, we propose that in French right edge marking can either reflect the presence of an Accentual Phrase (AP) boundary (whenever a LH* is realized, cf. Jun and Fougeron 2000), an Intonation Phrase (IP, signalled through a H%) or an intermediate phrase (ip) break (Jun and Fougeron 2000; D'Imperio and Michelas 2010), signalled through a H-tone (cf. Section 2 for a detailed definition).

Very recent work has in fact suggested that the emergence of an ip in French is not simply linked to a specific focus pattern or marked syntactic structure, since a right ip boundary can occur within broad focus utterances whenever the syntactic and prosodic structure allow it (Michelas and D'Imperio 2010a, 2010b, 2010c; D'Imperio and Michelas 2010). While the intermediate phrase break is generally syntax-driven (in that it is found at the NP/VP boundary when the NP is composed of at least 3 APs (cf. D'Imperio and Michelas 2010)), a right-edge Intonation Phrase break seems to be preferred when the focus domain is very narrow (i.e. restricted to part of a DP, such as an adjective or a demonstrative).

Moreover, the placement of an initial boundary (the initial rise or LHi, cf. Jun and Fougeron 2000; Welby 2002) does not appear to be restricted to the left edge of a Maximal Projection, but can occur towards the left edge of an argument that is part of a complex syntactic constituent, when focus is restricted to a single lexical item. Specifically, recent evidence (German and D'Imperio 2010) suggests that initial LHi rises mark the left edge of contrastive focus regions in French (see LHi on *marron* in upper panel of Figure 2), but that the probability of LHi also increases with phrase length. In other words, both phrase length and focus scope appear to be the relevant, additive factors for the appearance of an initial rise, and thus it is unlikely that LHi is a *focus marker* in the traditional sense. The present paper is intended to first touch upon the complexities of the distribution of phonetic and phonological evidence in French that might account for all the variability found in previous and current studies on focus and phrasing.
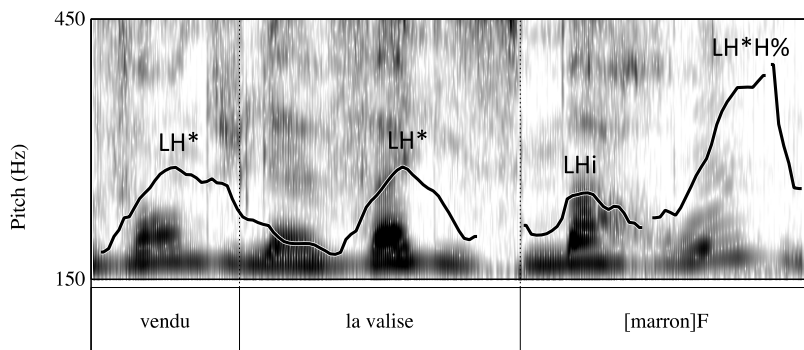
Figure 2. F0 curve and spectrogram for a section of the sentence *Mais à qui est-ce qu'Amélie a vendu la valise marron dans la rue Mignet?* 'But to whom has Amelie sold the brown suitcase on Mignet Street?' uttered with narrow focus on *marron* 'brown'.

2. The place of the intermediate phrase in the prosodic structure of French

2.1. The intermediate phrase in Jun and Fougeron's model

Two of the most recent autosegmental models of intonation in French, Jun and Fougeron's and Post's models, both agree on the existence of two levels of phrasing in French above the prosodic word: the Intonation Phrase (IP) and a lower ranked constituent, which is either tonally defined (the Accentual Phrase or AP in Jun and Fougeron's model) or rhythmically defined (the Phonological Phrase in Post's model). In contrast to Post's model, Jun and Fougeron (2000) postulate an additional third level of phrasing ranked between the Intonation Phrase and the Accentual Phrase, i.e. the intermediate phrase (ip), for which we find evidence in a number of stress-accent languages such as English and Italian. The intermediate phrase (ip) is postulated in order to account for specific intonation structures observed in marked syntactic constructions, such as tag-questions, in which a low pitch plateau is usually found after an accentual H* rise (see Figure 3), as well as for a high plateau found after focus in yes/no questions (Jun and Fougeron 2000: 224). According to Jun and Fougeron's first proposal, these low and high plateaus are the result of the presence of either a L- or a H- phrase accent controlling the pitch range from the last pitch accented word up to the final syllable of the phrase (through spreading). In the example in Figure 3, the Intonation Phrase is parsed into two ips. The first ip is

right-demarcated by a L-phrase accent controlling the pitch range from the last pitch accent to the end of the intermediate phrase.
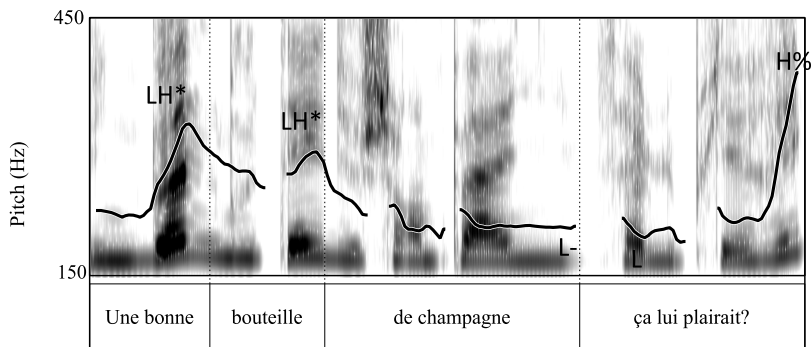
Figure 3.   F0 trace of the utterance *([Une bonne bouteille de champagne]$_{ip}$ [ça lui plairaît)$_{ip}$)$_{IP}$* 'A good bottle of Champagne, would he like it?' read by native speaker of French

Hence, Jun and Fougeron introduce the idea of an intermediate level of phrasing in French primarily to account for similar tonal spreading phenomena. In other words, the authors link the emergence of the ip to the presence of specific intonation contours and syntactic structures. However, the authors' later comment suggests that the phonetic and phonological properties of the ip in French are mostly unknown: "It is possible that there is a phonetic difference in the height or shape of the *f0* rise between H* and H*H-, and/or durational cues for this intermediate phrase level" (Jun and Fougeron 2000: 237).

Recent studies (D'Imperio and Michelas 2010; Michelas and D'Imperio 2010a, 2010b, 2010c) offer additional evidence regarding (i) the factors affecting the ip distribution and (ii) the phonetic and phonological properties of the ip. According to those studies, the intermediate phrase is not restricted to specific intonation contours or syntactic structure but can appear within broad focus (all-focus) utterances if both the syntactic and prosodic structures allow it. We know that prosodic structure is independent of, but related to, both syntactic and information structure. It is also generally assumed that phonological factors such as prosodic weight or speech rate play an important role in prosodic phrasing. Taken together, this evidence suggests that the emergence of an intermediate phrase level in French may be due to two different constraints. First, a syntactic constraint enforces the alignment of the right edge of a major syntactic break with the right edge of an ip. Secondly, a size constraint com-

petes with the syntactic constraint by requiring that an ip is made of minimally two APs. In the example sentences in Figure 4, the break between the subject noun phrase (NP) and the verb phrase (VP) is aligned with the ip right boundary, which is itself demarcated by a H-phrase accent.
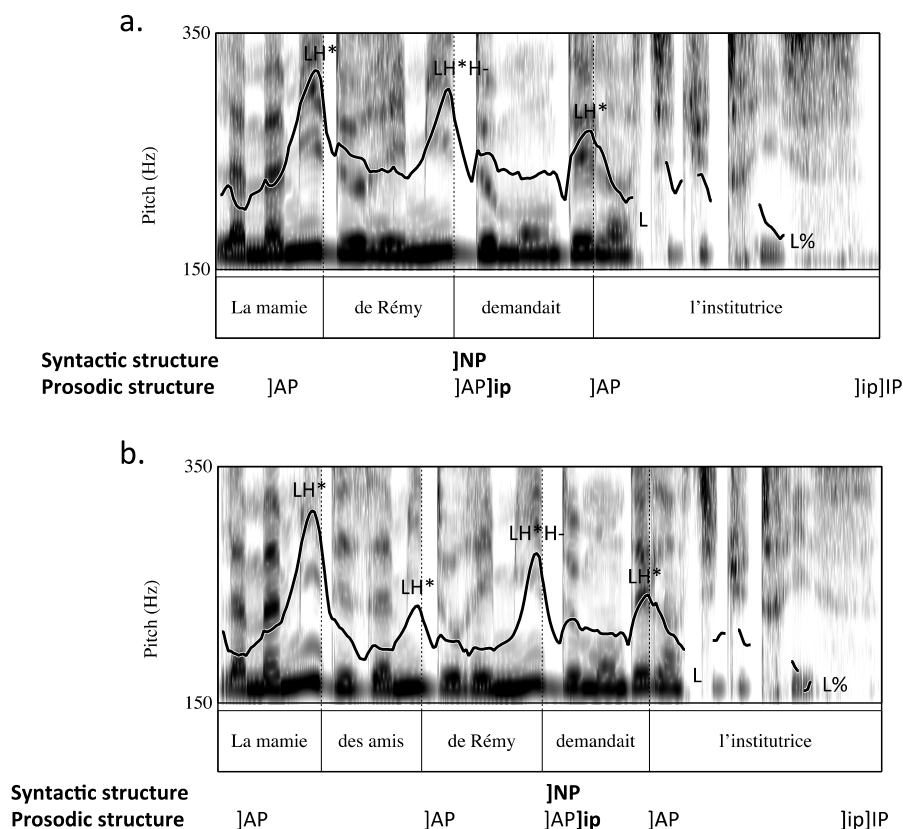
Figure 4.   F0 trace of the utterance *La mamie de Rémy demandait l'institutrice* 'Remy's grandmother asked for the teacher' where the subject noun phrase is made of 2 APs (4a) and of the utterance *La mamie des amis de Rémy demandait l'institutrice* 'The grandmother of Remy's friends asked for the teacher' where the subject noun phrase is made of 3 APs (4b)

Note that the last syllable of the intermediate phrase is produced with final lengthening that is significantly greater than that associated with an AP boundary (Michelas and D'Imperio 2010a). In stress-accent languages such as English or Italian, the ip is also the domain of downstep, and it is delimited at its

right edge by a phrase accent. For instance, Beckman (1986) showed that pitch reset is reinitialized after an ip boundary in American English. D'Imperio and Michelas (2010) have recently shown that, as in English, the intermediate phrase of French is the domain of downstep, but what is crucially different is that the pitch is reset right at the intermediate phrase boundary and not after it. Specifically, a H- phrase accent appears to also be responsible for blocking downstep of subsequent LH* accent within an initial ip (see Figure 4b).
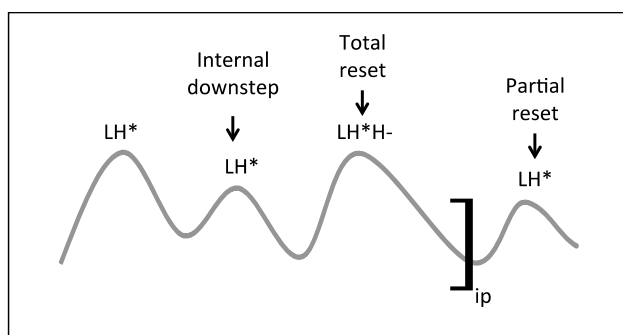
Figure 5.   Scheme of ip-internal downstep and both total (at ip edge) and partial (after ip edge) reset for sentences in which the target ip is made of 3 APs

3. Information structure and the role of the initial rise

3.1. Phonetic and phonological properties of the initial rise

The initial LH rise (LHi) is an optional rise occurring on one of the first sylla-bles of the accentual phrase (Jun and Fougeron 2000). Specifically, Welby (2006) has proposed that the initial rise tends to occur on one of the first sylla-bles of the first content word of the AP, on the basis of evidence of strong align-ment between the L target of the rise and the segmental region corresponding to the syllable onset of the content word. It has also been suggested that LHi can be marked by strengthening and lengthening of the syllable onset (Mertens 1992; Astésano 2001; Astésano et al. 2007), though strong empirical evidence is lacking.

  Both the final LH* and LHi appear to be correlated with hyper-articulation (greater tongue displacement, wider lip aperture, increase in duration and peak velocity) of the associated syllable, though a stronger effect is found for LH*

(Lœvenbruck 1999; Dohen and Lœvenbruck 2009). Yet in spite of such accounts, the status of the initial rise is more controversial than that of the final rise, primarily due to the much higher degree of variability associated with its occurrence and realization. Neglected by most studies on French prosody during the first part of the 20th century, more recent models treat the two rises either as the same tonal event or as different events. For instance, in the first autosegmental metrical model of French proposed by Hirst and Di Cristo (1984), the initial and final rise are not distinguished since both correspond to the metrical head of their tonal unit (TU), defined as the minimal unit of synchronisation of tones and segments. Several TUs combine to form a larger unit called intonation unit (IU).

In a more recent and quite different autosegmental-metrical model proposed by Post (2000), both rises are also described as similar, though in terms of two monotonal high pitch accents (H*) having the same shape and the same accentual properties (see Figure 6).
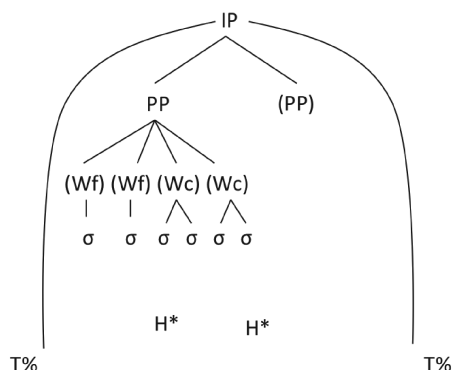
Figure 6. Post's model of French intonation. The intonation phrase IP is demarcated by two boundary tones T% and includes one or more phonological phrases PP containing at least one H*. Taken from D'Imperio et al. (2007)

In Post's model, the final pitch accent in the intonation phrase can also take the form of a bitonal H+H*, which is proposed to account for cases in which the *f0* peak is aligned with the penultimate syllable of the phonological phrase. Moreover, in that model, the occurrence of a final LH* is accounted for in terms of phonetic implementation differences by means of a rule leading to the optional insertion of a L tone between the initial and the final H* pitch accents ("tone-linking rule", cf. Gussenhoven 2004).

Other authors claim instead that the initial and final rises are structurally different, and that only the final rise is an actual pitch accent. Jun and Fougeron (1995) first proposed that the initial LHi rise is a bitonal phrase accent, associated to the left edge of the AP, while the final accent is a bitonal LH* pitch accent whose H* tone is associated to the last full syllable of the accentual phrase (while the L tone is unassociated). In Welby's proposed revision of this model (Welby 2002, 2006, "early L double association hypothesis"), the L tone of the initial rise seeks a primary association with the first syllable of the first content word of the AP and an optional secondary association with the edge of an earlier syllable, which is often, but not always, the first syllable of the AP. Figure 7 below illustrates Jun and Fougeron's proposal including Welby's revision.
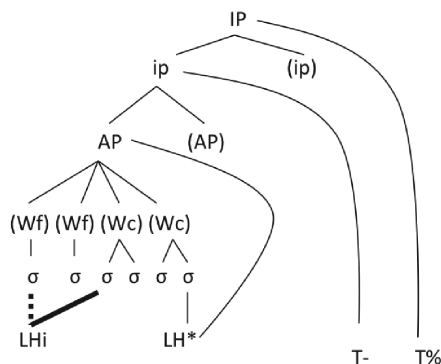
Figure 7.   Jun and Fougeron's model with Welby's (2002, 2006) revision. Primary association of the L tone is shown through a solid line, while the secondary association is shown by the dotted line

3.2. Factors affecting the distribution of LHi

The occurrence of LHi in an accentual phrase is highly variable, and the details of its distribution and realization are poorly understood. While on the one hand LHi is generally considered to be an "optional" feature of AP, its occurrence has been shown to be sensitive to a wide range of factors, including phonological, syntactic, and discourse-level ones. Welby (2006) shows, for example, that the length of an AP is a good predictor of whether LHi occurs in it, such that longer APs are more likely to include LHi than shorter APs. This was true whether length was measured in number of syllables or overall duration, though syllable number was a slightly better predictor for most speakers. The same

study showed that LHi occurred more often for slower speaking rates than for faster ones.

Jun and Fougeron (2000) show that position in a sentence matters. In that study, LHi was more likely to occur in APs occurring sentence-initially than for APs in either sentence-medial or sentence-final positions. The authors note additional stylistic and phonological factors that have been suggested by various authors including speaking modality (e.g. imperative vs. exclamation), speaking style (reading vs. spontaneous), segmental composition of the syllable, and syllable structure (open vs. closed, onset vs. no onset) (Fónagy 1980; Vaissière 1974; Lucci 1983).

Syntax can also be relevant for the occurrence of LHi. Astésano et al. (2007) provide the most direct evidence of this, showing that the tendency for LHi (or IA in their presentation) to occur in an AP is correlated with the degree of syntactic embedding of the word boundary occurring at the left edge of that AP. Consider that for the sequence *les bagatelles et les balivernes saugrenues* ('the crazy trifles and nonsense'), the adjective *saugrenues* ('crazy') may be interpreted as modifying only the second NP *les balivernes* ('the nonsense') as in (1b), or as modifying the conjunction of the two NPs *les bagatelles et les balivernes* ('the trifles and the nonsense') as in (1a). A typical phrasing pattern for this string is shown in (2).

(1)   Syntactic possibilities:

    a. *([[les bagatelles] et   [les   balivernes]] saugrenues])*
         the trifles   and the   nonsense   crazy
    'the crazy trifles and nonsense'

    b. *([les   bagatelles] et   [[les balivernes]   saugrenues])*

(2)   Typical phrasing pattern:
    (*les bagatelles*)$_{AP}$ (*et les balivernes*)$_{AP}$ (*saugrenues*)$_{AP}$

This predicts that the embedding level of the syntactic juncture between the two NPs will be *lower* in (1a) and *higher* (1b), while the opposite is predicted for the juncture between the second NP and the adjective. The authors show in a controlled production experiment that LHi is more likely to occur when the left edge of the AP[1] corresponds to a syntactic juncture that is less deeply embedded. In other words, LHi occurred more often at the left edge of the AP comprising *saugrenues* for (1a) than for (1b), while it occurred more often at

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1.   Note that AP is reserved solely for reference to an Accentual Phrase throughout our discussion, and not to an Adjective Phrase.

the left edge of the AP comprising *et les balivernes* more often for (1b) than for (1a).

While this finding seems to point to a model in which LHi is recruited to disambiguate syntactic alternatives, it is important to note that phrase length also had an effect on LHi occurrence, such that longer content words were associated with higher rates of LHi. The authors conclude from this finding that LHi is principally a marker of phonological structure, and suggest that the syntactic effects might be indirect and possibly mediated by an intermediate level of phrasing. That both effects were present in the same study suggests a complex picture for the distribution of LHi.

3.3. LHi and information structure

The relationship of LHi to information structure presents a similarly complex picture. While focus, contrast and certain types of emphatic meaning are often associated with accentuation of non-final syllables (Di Cristo 1999a, 2000; Jun and Fougeron 2000; Féry 2001, *inter alia*), typically these involve specialized contours that are distinct from LHi in several ways. Perhaps most significantly, these accents are reported as occurring alone in their phrasal or intonational unit. Additionally, they are typically assumed to be associated to a prominently stressed syllable. LHi, by contrast, always occurs in an AP *along with* LH* and has no necessary association to stress. Jun and Fougeron (2000) elicited such specialized non-final accents in contexts like (3b), in which one word was singled out as carrying a corrective meaning.

(3) a. *Marion ne   mangera pas   des   ananas   au petit déjeuner,*
         Marion   NEG eat.FUT   NEG some pineapples at breakfast
         mais . . .
         but
         'Marion will not eat pineapples for breakfast, but . . .'

     b. *Marion mangera des   bananes au petit déjeuner.*
         Marion   eat.FUT   some bananas at   breakfast
         'Marion will eat some bananas for breakfast.'

The authors report that these sentences were generally produced with a single prominent rise (a *focus accent*, or *Hf*), which was higher than LH* in a corresponding neutral focus pattern, and was followed by a low plateau extending to the end of the utterance (or a high plateau for polar interrogatives). Although Hf

occurred on both final and non-final syllables, however, the resulting pattern was never LHLH. Such instances of non-final rises therefore more closely resemble the various *accents d'insistance* or *accents emphatiques* mentioned by Di Cristo (1999a, 1999b, 2000) and others, and they are distinct from the LHi of the framework we are assuming here.

Di Cristo (2000) observes that non-final rises occur in conjunction with final accents in cases of *information focus*[2]. In that proposal, constituency at various levels of the grammar may be reflected in prosodic structure by a "bipolarization" effect, whereby "promotion of the extremities" of some constituent results in accents being assigned to both its left and right edges. More recently, Beyssade et al. (2010) present the results of two studies showing that information focus is both marked in production and identified in perception by *prosodic highlighting*, which in their proposal "involves an initial accentuation, (IA) which may form an *accentual arch* with the following rising accent, or triggers a high plateau up to the following accent." To the extent that such non-final rises correspond to LHi, this suggests a more complicated picture than even Astésano et al.'s (2007) study presents. It raises the possibility, in other words, that LHi is sensitive not only to phonological, stylistic and syntactic factors, but to discourse-level ones (i.e., focus) as well.

Overall, the relationship between prosody and information structure is not well-understood for French. Of the wide range of effects that have been suggested, perhaps the most well-documented is that the region between the end of a corrective or emphatic focus and the end of the sentence (or post-focal region) may exhibit a marked reduction in *f0* range and *f0* movement. In declaratives, this takes the form of a low plateau extending from the end of the last major falling event, while for polar interrogatives this is a high plateau extending more or less from the highest point of the last rise (Jun and Fougeron 2000). The phenomenon has variously been formulated in terms of *dephrasing* or *deaccenting*, though Jun and Fougeron (2000) show that such regions maintain their durational cues to phrasing, and thus may not be appropriately characterized as "dephrased".

On the view that the location and extent of the focused constituent form part of a speaker's intentions that must be recovered by the listener, then post-focal deaccenting provides an effective cue to the location of the *right* edge of focus, since it marks a kind of transition point between the focal region and the post-focal region. It is not clear whether such cues exist for signaling the *left* edge of focus in French. For one thing, there does not seem to be the equivalent of

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2. In direct answers to wh-questions, an information focus is the portion of the utterance that corresponds to the wh-element of the question that it resolves.

prefocal deaccenting. Instead, both the prefocal and focal regions are, subject to conditions of rhythm and syntax, phrased into APs bearing final rises. The result is a more or less continuous distribution of accentual features that span the boundary between the prefocal and focal regions. Consider the sentence from (3b) shown in (4) with hypothetical foci of two different sizes having different left edges.

(4) *Marion   mangera   [des bananes]$_F$ au petit déjeuner*
     (   )$_{AP}$ (   )$_{AP}$ (   )$_{AP}$
         LH*   LH*   LH*

     Marion   [mangera   des bananes]$_F$ au petit déjeuner
     (   )$_{AP}$ (   )$_{AP}$ (   )$_{AP}$
         LH*   LH*   LH*

Notice that in both cases, regular phrasing into APs results in an identical distribution of LH* accents. Thus, if only the distribution of LH* is considered, it is not possible for a listener to recover the location of the left edge of focus in such a case. While there is limited evidence that the pre-focal region is distinguished from the focal region by having a compressed *f0* range (Touati 1987; Jun and Fougeron 2000; Dohen and Lœvenbruck 2004), it has not yet been established whether this is a reliable marker that could be used by the listener to recover the position of the left edge of focus.

In both Jun and Fougeron (2000) and other quantitative studies (Dohen and Lœvenbruck 2004), focus is conceptualized in terms of corrective or emphatic contrast. Féry (2001) reports on a production study involving a notion of focus based on direct answers to wh-questions, though the quantitative results are not presented. Other work has emphasized the role of additional focus-like categories including intensification (Di Cristo 2000) and information focus (Di Cristo 2000; Beyssade et al. 2010). Krifka tentatively proposes to unite the various notions of focus cross-linguistically under the idea that it is used to "indicate the presence of alternatives that are relevant for the interpretation of linguistic expressions" (Kifka 2007: 18). What it means to be "relevant for interpretation" may vary depending on the particular phenomenon being observed. In the case of certain focusing adverbs, for example, the way in which focus gives rise to alternatives may have consequences for the truth conditions of the sentence. In its more pragmatic uses, focus may be relevant for interpretation because it establishes parallels between different linguistic units in the same discourse. This latter notion is closely related to Rooth's (1992) construal of Contrastive Focus and forms the basis of a pair of studies conducted by German and D'Imperio (2009, 2010).

In the first of these studies, German and D'Imperio (2009) found preliminary evidence that initial rises are more likely to occur in APs whose left edge coincides with the left edge of a contrastive focus. In that study, a reading task was used to elicit contrastive focus in polar interrogative clauses that were preceded by closely parallel clauses. This is illustrated in (5).

(5)   a. *Je sais   qu'Amélie   a   vendu la valise   jaune dans la   rue*
         I   know that Amélie has sold   the suitcase yellow in   the street
         Mignet, mais . . .
         Mignet but
         'I know that Amélie sold the yellow suitcase on Mignet Street, but . . .'

      b. *a qui   est-ce qu'Amélie   a   vendu la valise   [marron]_F dans*
         to whom is   it that Amélie has sold   the suitcase brown   in
         la   rue   Mignet?
         the street Mignet
         'to whom did Amélie sell the [brown]_F suitcase on Mignet Street?'

Since the two complement clauses in (5a) and (5b) differ only in the value of the adjective modifying the noun *valise*, the prediction is that *marron* ('brown') is established in this context as a contrastive focus. Keeping the target sentence (5b) fixed, the context was then varied in a way that systematically established foci of different sizes. In (6) and (7), for example, the complement clause in the first sentence in each pair differs from that in the second sentence in such a way as to establish the direct object (*la valise marron*) and the VP (*vendu la valise marron*) as the contrastive foci in (6b) and (7b), respectively. Note that the location of the right edge of the contrastive focus region is not predicted to differ across the two contexts.

(6)   a. *Je sais   qu'Amélie   a   vendu la   caméra dans la   rue*
         I   know that Amélie has sold   the   camera in   the street
         Mignet, mais
         Mignet but
         'I know that Amélie sold the camera on Mignet Street, but . . .'

      b. *a qui   est-ce qu'Amélie   a   vendu [la valise   marron]_F dans*
         to whom is it   that Amélie has sold   the suitcase brown   in
         la   rue   Mignet?
         the street Mignet
         'to whom did Amélie sell [the brown suitcase]_F on Mignet Street?'

(7) a. *Je sais   qu'Amélie   a   déjeuné   dans la   rue   Mignet,*
         I   know   that Amélie   has   eaten lunch in   the   street Mignet
         mais . . .
         but
         'I know that Amélie ate lunch on Mignet Street, but . . .'

     b. *a qui   est-ce qu'Amélie   a   [vendu la valise   marron]$_F$ dans*
         to whom   is it   that Amélie has sold   the suitcase brown   in
         la   rue   Mignet?
         the street Mignet
         'to whom did Amélie [sell the brown suitcase]$_F$ on Mignet Street?'

In short, LHi showed a tendency to "track" the left edge of focus across three
different contexts by occurring on the AP whose left edge coincided with the
left edge of the focus (see Figure 2). While the overall number of items in the
study was low, the observation echoes Di Cristo's (2000) suggestion that initial
rises (or LHi) may be one structural feature that can be recruited to mark the
location of the left edge of focus.

    In a follow-up study, German and D'Imperio (2010) more directly addressed
the question of whether LHi marks the left edge of focus. The targets in that
case were wh-questions including a direct object consisting of a 3-syllable
noun phrase (i.e., *le merlan*) and either a 3- or 5-syllable prepositional phrase
(underlined), followed by a temporal modifier. This is illustrated in (8).

(8) a. 3-syllable (short):
         Qui   a   commandé le   merlan aux navets ce   soir?
         Who has ordered   the whiting with turnips this evening
         'Who ordered the whiting with turnips this evening?'

     b. 5-syllable (long):
         Qui   a   commandé le   merlan aux macadamias ce   soir?
         Who has ordered   the whiting with macadamias this evening
         'Who ordered the whiting with macadamias this evening?'

These sentences were elicited as the second of a series of three information-
seeking questions[3]. Thus, specific patterns of focus were induced by manipulat-
ing the size of correspondence between the target and the questions occurring
before and after it. In (9b), for example, the focused element is predicted to be

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3.   The participants used the questions to retrieve specific pieces of information from a
     speaking partner in a cooperative task.

the entire direct object (DO) [*le merlan aux navets*], since the surrounding context (i.e., (9a) and (9c)) suggests that that constituent is the relevant point of contrast. In the PP-focus condition shown in (10b) on the other hand, the focus is limited to the prepositional phrase *aux navets* for similar reasons. Thus, each target item occurred in each of four conditions: DO-Focus/short, DO-Focus/long, PP-Focus/short and PP-Focus/long.

(9)   DO-Focus
  a. *Qui a   commandé l'entrecôte ce   soir?*
     who has ordered   the steak   this evening
     'Who ordered the steak this evening?'

  b. *Qui a   commandé [le merlan aux navets]$_F$ ce   soir?*
     who has ordered   the whiting with turnips   this evening
     'Who ordered the whiting with turnips this evening?'

  c. *Qui a   commandé les gambas ce   soir?*
     who has ordered   the prawns this evening
     'Who ordered the prawns this evening?'

(10) PP-Focus
  a. *Qui a   commandé le merlan à   la   sauce citron ce*
     who has ordered   the whiting with the sauce lemon this
     soir?
     evening
     'Who ordered the whiting with lemon sauce this evening?'

  b. *Qui a   commandé le merlan [aux navets]$_F$ ce   soir?*
     Who has ordered   the whiting with turnips   this evening
     'Who ordered the whiting with turnips this evening?'

  c. *Qui a   commandé le merlan aux câpres ce   soir?*
     Who has ordered   the whiting with capers this evening
     'Who ordered the whiting with capers this evening?'

If LHi marks the left edge of focus, then the prediction is that LHi should be more likely to occur at the left edge of an AP comprising the noun phrase in the case of (9b) (since that is also predicted to be the left edge of the contrastive focus), while it should be more likely to occur on an AP comprising the prepositional phrase in a case like (10b). Recall, however, Welby's (2006) finding that longer APs are more likely to include LHi. On the assumption that the prepositional phrase comprises a single AP in both (8a) and (8b), this leads to a

second, independent prediction that LHi should be more likely to occur on the prepositional phrase when it is *long* than when it is *short*.

In fact, the results of 192 tokens taken from eight speakers showed a fairly strong correlation between focus and LHi. For the position corresponding to the left edge of the prepositional phrase, LHi was more likely when that position coincided with the focus left edge (51% versus 33%), as illustrated in Figure 8. Similarly for the left edge of the noun phrase, LHi was significantly more likely when that position coincided with a focus edge (34% versus 21%). Importantly, the length of the prepositional phrase also mattered. As predicted, LHi was more likely to occur on the prepositional phrase when it was long (54%) than when it was short (30%).
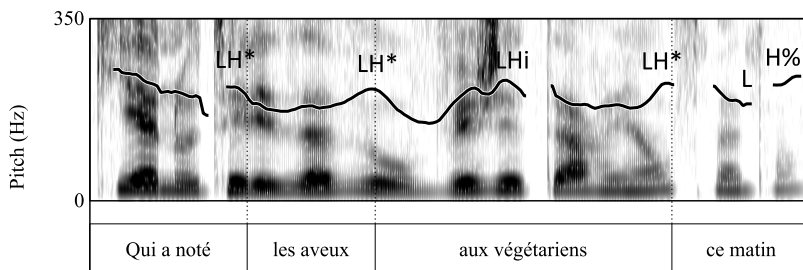

Figure 8.   LHi realized at the left edge of the prepositional phrase in a *PP-focus* context (long) for one speaker in the utterance *Qui a noté les aveux [aux végétariens]$_F$ ce matin* 'Who wrote down the confessions to the vegetarians this morning'

A statistical analysis[4] revealed that both factors (length and focus size) were significant for the occurrence of LHi for the position corresponding to the left edge of the prepositional phrase. However, the analysis revealed no interaction between these factors. In other words, the effect of focus size was constant whether the prepositional phrase was long or short. Conversely, prepositional phrase length had a constant effect whether the focus included just the prepositional phrase or the entire direct object.

This latter finding is somewhat surprising. Consider that if the realization of LHi is directly related to AP length, due, for example, to some (possibly probabilistic) constraint on the minimum size of AP that will support both LHi and

4. The data were modeled using mixed effects linear regression treating PP-length and focus size as fixed effects, and items as random effects.

LH*[5], then LHi should be so unlikely in very short APs that its occurrence is insensitive to the locations of focus boundaries. In the limit, one-syllable APs cannot support LHi at all[6]. Similarly, if the relationship between LHi and phrase length is due to a rhythmic constraint *requiring* longer APs to include LHi, then LHi should be so common in very long APs (e.g., seven syllables) that the effects of focus are negligible. Instead, the data show that the effects of both factors are independent and additive, at least for the particular range of AP length that was addressed.

Consider also the implications of the fact that LHi was sensitive to both AP length and focus. It suggests, among other things, that LHi is not a *marker* of focus in the traditional sense. Given that LHi is sensitive to AP length at all, in other words, the association between LHi and focus can only ever be partial or imperfect at best. Setting aside for a moment the issue of precision in the study, a follow-up analysis showed that a listener who uses LHi as the sole indicator of focus size would be able to make the correct prediction only 60% of the time[7]. A similar remark applies to the findings of Astésano et al.'s (2007) study.

4. Discussion

The findings presented above suggest that the relationship between LHi and each of the factors influencing its distribution is indirect in one or more ways. But what type of model could capture such effects without assuming a direct relationship? Astésano et al. (2007) conclude from their results that LHi is first and foremost a reflex of phonological structure, and on that basis suggest that it is linked to an intermediate level of phrasing. While the authors do not propose a specific mechanism along these lines, there are certain characteristics that such a model would have to include in order to account for the observed correlations. In what follows, we outline some of those characteristics and suggest

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5. In Post's (2000) proposal, non-final accents essentially represent a strategy for stress-clash avoidance after restructuring (i.e., boundary erasure). Since restructuring typically leads to larger phrases, non-final accents are predicted to be unnecessary in very small phrases.

6. In Jun and Fougeron's (2000) proposal, each tone must be realized on its own syllable, and every AP must include at least one low tone. This predicts that LHi should be impossible for even a two-syllable AP, though Welby (2006) shows experimentally that this prediction is not born out. In that study, initial rise occurred on 13% of all two-syllable words.

7. A chi-square showed that this rate differed from chance (51%) at the $p < 0.1$ level.

promising approaches for incorporating them into existing models. However, in the absence of further data, for example, linking the effects of syntax with the effects of focus and phrase length, or a more direct metric for the identification of the ip, we stop short of making an explicit proposal.

One promising approach to indirect relationships like those suggested by the data above is to assume that an additional level of description, such as the ip, mediates between the two levels of primary interest. To explain the association between focus and LHi, for example, we might assume that the operative principle involves a rule or constraint requiring that a focus constituent project this intermediate level. In short, a focus constituent must be contained in a single ip[8]. A very similar proposal would apply to the syntactic effects: all else being equal, a less embedded syntactic constituent has a greater tendency to project an ip than a more embedded one.

Such a principle might itself be weak, probabilistic, or even optional. We know from the D'Imperio and Michelas (2010) studies, for example, that ip boundaries appear at the subject-VP juncture in broad focus utterances, so any focus-based rule or constraint must at a minimum accommodate the role of syntax. Pierrehumbert (1994) proposes that for English, there is a variable constraint on the size of the prosodic domain that gets promoted to a level of stress that would be sufficient for accentuation. This process of *prosodic promotion* is not random in that account, but may "reflect discourse factors" (Pierrehumbert 1994: 15) and is "generally available to strengthen prosodically weak elements if the speaker for any reason wishes to accent them" (Pierrehumbert 1994: 13). In the case of French, the process would apply to promote a given constituent, not to a higher degree of stress, but to a higher level unit in the prosodic hierarchy. Thus, a string that is initially parsed as an AP within some larger ip, would by way of prosodic promotion be reparsed as its own ip. In effect, the suggestion is that speakers select, with some variability, the size of the unit to which this process applies based on discourse needs such as signalling the scope of focus or disambiguating between possible syntactic parses.

Note that it is not sufficient to establish a relationship between focus or syntax and the ip. The link still needs to be made between LHi and the ip. Importantly, however, the results of the Michelas and D'Imperio (2010b) studies are not suggestive of a one-to-one association between these two levels either (though no conclusive analysis has been conducted). More data is needed to determine whether this relationship is itself probabilistic, or whether there are additional factors or levels of description that are still unaccounted for.

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8. Notice the similarity to Féry's (2001) proposal, which suggested that a focus is constraint to project its own phonological phrase.

Finally, any viable model needs to account for the effects of length on LHi. One fairly straightforward approach is to assume that longer APs are more likely to be parsed as their own ip. Similar to the case of focus, this in turn could be explained by a probabilistic or stylistically driven constraint on the domain of ip assignment. Thus, with the single assumption that LHi is a feature of an ip (as opposed to an AP), it is possible to explain why longer APs are more likely to include LHi without invoking either rhythmic or tonal crowding constraints, which are not suggested by the data in any case.

The model elements sketched above are merely suggestive, and we wish to be clear that there is currently no data that straightforwardly supports one particular model over any other. However, the fact that the data may be explained by assuming a level of prosodic structure for which there is independent evidence is, we believe, significant. The purpose of presenting it in this fashion is therefore to highlight the potential for complex interactions in a problem that is typically approached from only one perspective. On the one hand, a traditional focus-to-accent approach seeks to identify robust markers of information structure in the traditional sense, leaving little role for structural effects at the level of phrasing, for example. Crucially, it cannot explain why the left edge of a focus region would be so unreliably marked given that it is marked at all, or why LHi is sensitive to so many different factors. On the other hand, a phrasing or edge-based approach that emphasizes the comparative lack of intonational "marking" in French as compared with Germanic languages, for example, has too little to say about the role of post-focal deaccenting on the one hand, and the complex distribution of LHi on the other. The point we wish to highlight here is that the type of data that will eventually lead to an adequate model of prosody and information structure in French will need to take into account both issues simultaneously by, for example, establishing the relative effect size of factors from different levels of description within the same study, following the precedent of Astésano et al. (2007), German and D'Imperio (2010), and others. Moving forward, then, our approach seeks an integrated model that takes into account both types of descriptions, as well as any additional interdepencies that they bring to the problem.

Acknowledgments

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