

PROSODY AND PRAGMATICS OF *WH*-INTERROGATIVES*

Nancy Hedberg, Juan M. Sosa, Emrah Görgülü, Morgan Mameni
Simon Fraser University

1. Introduction

We report the results of a corpus study designed to investigate the correlation between the prosodic form and pragmatic function of *wh*-interrogatives in North American English. Our prosodic analysis follows the guidelines of ToBI (Beckman and Ayers-Elam 1997). For the pragmatic analysis, we introduce a novel set of categories that take into account several discourse factors involved in the conversational use of *wh*-interrogatives. Our findings suggest a strong divergence in the pragmatic function of falling and rising *wh*-interrogatives, which we discuss below.

1.1 Background

It is commonly observed that *yes-no* questions tend to be pronounced with rising intonation in English (c.f. Pierrehumbert and Hirschberg (1990); and for a corpus study, see Hedberg, Sosa and Görgülü (2008)), while *wh*-questions tend to be falling. This difference presents a difficult challenge, which any complete theory of intonational meaning would need to explain. What is it about *wh*-questions compared to *yes-no* questions that causes them to fall instead of rise? Gussenhoven (1984) claims that rising contours indicate ‘testing’ while falling contours indicate ‘addition’, but he doesn’t explain why *wh*-questions, which presumably involve ‘testing’ as do *yes-no* questions, should be falling in intonation. Pierrehumbert and Hirschberg (1990) argue for a compositional semantic analysis of ToBI categories. They claim that the low phrase accent (L-) and low boundary tone (L%) (typical of *wh*-questions) both indicate completion, i.e. lack of connection to subsequent discourse; but it is not clear how their theory can explain the difference, since *wh*-questions are linked to their answers just as *yes-no* questions are. Pierrehumbert and Hirschberg associate *yes-no* questions with a high phrase accent (H-) and boundary tone (H%), so that *wh*-questions and *yes-no* questions are supposed to differ from each other on the parameter of association with subsequent discourse.

Perhaps the difference has to do with an added presupposition being associated with *wh*-questions. Thus, Halliday (1994) suggests that *wh*-questions tend to be falling in intonation because the polarity is known in *wh*-questions just as it is in declarative statements and unlike in *yes-no* questions. Bartels (1999) accounts for the intonational difference by claiming that a *wh*-question evokes an existential presupposition in the body of the question, which is asserted by the speaker and thus is marked by an L- phrase accent. Steedman (2007) claims that

* This research was supported by SSHRC standard research grant # 410-2007-0345 awarded to Nancy Hedberg and Juan M. Sosa.

the falling contour indicates an uncontroversial rheme (H*) with speaker commitment (L-L%). This analysis, like that of Bartels, is perhaps justified by the observation that the body of a *wh*-question is presupposed and thus is uncontroversial and speaker-committed.

However, the situation is further complicated by the fact that not all *wh*-questions are falling in intonation. For example, Bolinger (1989) suggests that reclamatory *wh*-questions tend to be rising. These are questions with which speakers ask for a repetition because they failed to understand something (e.g., echo questions). But why should reclamatory questions be less presuppositional than ordinary *wh*-questions? We decided that it would be useful to conduct a corpus study in which naturally occurring *wh*-questions would be annotated for intonation, and their contexts examined to ascertain what aspects of meaning contribute to selection of choice of intonational contour.

2. Data and methods

The data were taken from the CallHome Corpus of American English (Canavan et al. 1997), a corpus of 30-minute recorded telephone calls between people who know each other, with 10-minute segments of each of the 120 conversations transcribed; and the Fisher [American] English Corpus (Cieri et al. 2004), a corpus of transcribed ten-minute conversations on assigned topics between people who do not know each other. 200 *wh*-interrogatives were extracted from the two corpora, with 87 interrogatives coming from the CallHome corpus and 113 interrogatives coming from the Fisher Corpus. Utterances consisting only of a *wh*-word without interrogative syntax were not included.

2.1 Prosodic notation

Our phonological analysis follows the ToBI guidelines. We used Praat (v. 4.4.04, Boersma and Weenink (2006)) for phonetic analysis of the speech files. The search for questions in the transcripts was performed partially automatically, and we extracted the wav files using GoldWave (v. 5.54). The last three authors annotated the sound files together. Our ToBI coding system was tested for intercoder reliability in an earlier study (Hedberg, Sosa, and Fadden 2006), with the resulting transcriber-pair-word agreement of 75.7% on presence and type of pitch accent concluded to be typical for reliability results reported for ToBI annotation in the literature.

After performing the ToBI annotations, the last two authors classified the *wh*-questions into groups exhibiting different final nuclear contours, listened to the examples again and examined the transcripts to ascertain possible semantic and pragmatic conditioning of the intonational patterns. We did the phonetic analysis before we did the semantic/pragmatic analysis, thus avoiding semantic bias in the prosodic annotation.

The *wh*-questions were classified pragmatically according to the function that the *wh*-question played in the conversation. Then, the pragmatic classification

was compared to the classification of nuclear contours to see if any pragmatic functions of the different nuclear contours could be identified. The categories of the pragmatic classification are discussed in section 2.2 below.

2.2 The pragmatic analysis

As our study aims to explain the prosodic variation of *wh*-questions in terms of their use in discourse, we defined five binary dimensions which we considered relevant for the pragmatic characterization of each question. Our pragmatic analysis was carried out in two steps. The first step involved assigning a plus or a minus value to each question with respect to our five binary dimensions. The second step involved using the collection of features we obtained for each question in step one, and classifying the questions that shared the same values as a distinct category. We discuss these dimensions and the resultant categories below.

First, we need to settle some terminological issues. We found that the terms *Speaker* and *Hearer* do not suffice for a pragmatic analysis of interrogatives in discourse. This is due to the interactive nature of dialogue, where the role of the speaker and hearer constantly change across turns, and most notably during a question-answer exchange. We reserve the term *Speaker* (S) for the conversational participant who holds the floor at a particular stage of the dialogue for an *extended* duration. The *Hearer* (H) designates the conversational participant whom the speaker addresses. However, note that a hearer B may ask questions while the speaker A retains the floor, as we commonly found in our corpus. Therefore, we found it useful to introduce the term *Interrogator* (I) to designate the participant asking a question, regardless of whether this participant is the speaker or the hearer at the stage of the dialogue when the question is posed. Let us illustrate what we mean with examples.

- (1) [A has been narrating a story]
 A: Joel then turned up the day after I arrived and drove us mad. Drove us crazy. He was more obnoxious than he's ever been . . .
 B: uh-huh, **how do you know?** You haven't seen him in ages.

(1) represents a conversational turn, featuring two participants A and B. Since A is dominating the conversational floor during this particular exchange (A is narrating a story), we reserve the term *Speaker* for A. Consequently, since A is addressing B, we refer to B as the *Hearer* for this segment of the dialogue. Now in this exchange, obviously B also speaks—but does so without claiming the floor from A. B raises an issue for A via an interrogative, which A now needs to resolve. We will say that in (1) the *interrogator* is the hearer. Now contrast the above example with the one below in (2).

- (2) A: Bob will still be in Florida for a couple of weeks so I think I'll go up like to Philadelphia again and then I can really visit there's a lot of people I'd love to see I haven't {breath} I haven't seen Pearl. **How is Pearl doing?**

In (2), A has control over the floor, and is hence the speaker, but she uses the interrogative ‘How is Pearl doing?’ to pass the floor to B. That is, A gives up her turn by means of an interrogative. In (2) we will say that the *interrogator* is the *speaker*. As it will become apparent below, this is a useful distinction to draw in the pragmatic analysis of interrogatives.

2.2.1 Pragmatic dimensions for *wh*-interrogatives

We started our analysis by first examining the immediate environment of every instance of a *wh*-interrogative in the transcripts and determined five tractable factors to help us characterize the particular use of each interrogative in the discourse. For each factor, we assigned a plus value to those interrogatives that satisfied it, and assigned a minus value otherwise. We refer to each factor as a Dimension D_{i-v} , which is an instruction to assign the value [+] to a question q , only if q satisfies the condition imposed by D_n . Otherwise, q receives the value [-] for D_n .

D_i : q is Information Seeking (IS) For every question q , we determined whether q is used to *solicit* information [IS: +]. Non-information soliciting questions [IS: -] include rhetorical questions, back-channel questions, and questions to self. We classify a question as information seeking only when the interrogator uses the question as a strategy to remedy an informational gap in her information state.

D_{ii} : q is Floor Passing (FP) For every question q , we determined whether q is used to pass/give up the conversational floor. This dimension determines whether the interrogator is the speaker ($I = S$), or the hearer ($I = H$). Note that a question is floor passing [FP: +] only when $I = S$.

D_{iii} : q is Topic Changing (TC) For every question q , we determined whether q changes the topic of the immediate discourse [TC: +], or retains it [TC: -].

D_{iv} : q is Interruptive (INT) For every question q , we determined whether q interrupts the course of an active utterance. A question q is [INT: +] iff the onset of q overlaps with an utterance U , such that the onset of U precedes the onset of q , and U has not reached its terminus. Note that [INT: +] does not necessarily require *phonetic* overlap between the question q and the utterance U . We classified a question q as [INT: +] only if q begins before the information intended by U has concluded.

D_v : q 's propositional content is In Record (IR) For every question q , we determined whether the propositional content of q is already *given* in the preceding discourse, i.e. the propositional content of q is in the conversational record. A question is [IR: +] iff there exists a proposition p in the discourse prior to q , such that p counts as an answer to q .

As every question was evaluated according to the above five binary dimensions, we were able to characterize each question as an ordered quintuple of [+] and [-] values, which gives us a total of $2^5 = 32$ possibilities. In order to put the utility of these of this classification to test, we focused on a much more coarse-grained selection of these possibilities. In particular, we identified nine categories

that our collection of *wh*-interrogatives fell into, where each category characterizes the use for which a *wh*-interrogative may be employed in dialogue. We now turn to the description of our nine pragmatic categories.

2.2.2 Pragmatic categories for the discourse function of *wh*-interrogatives

We classified the function of each question with respect to nine categories. We identified each category in such a way that it was minimally distinct from the other eight in one dimension. These categories are listed in Table 1, specified according their feature values with respect to the dimensions defined above. As already mentioned, our categories provide a much more coarse-grained selection of possibilities than the full range our dimensions can in theory identify. This is so, as some of our categories will be underspecified with respect to some of the dimensions. We use the symbol \pm for those dimensions that a certain category is indifferent about. For example, as apparent from the entry for Rhetorical questions in Table 1, any question that is not *information seeking* [IS: -] is a rhetorical question—*regardless of its remaining 4 values*. This is not to say, of course, that the remaining features are extraneous. In fact, a dedicated study for the intonation of rhetorical questions could very well exploit these values. For the purpose of the present study, however, we will not be concerned with the fine details of rhetorical questions, but merely class all non-information seeking questions under one heading.

In our discussion below, we will designate each category as a quintuple of plus [+] and minus [-] values specified for each of the above dimensions in the following order (IS, FP, TC, INT, IR). We will also use the symbol [\pm], where the value of a dimension is underspecified for that category.

Pragmatic Category	Label	IS	FP	TC	INT	IR
Elaborative Detail	ED	+	-	-	-	-
Floor Deferring	FD	+	+	\pm	-	-
Directing Information Flow	DIF	+	-	+	-	-
Rhetorical	R	-	\pm	\pm	\pm	\pm
Supplementary Information	SI	+	-	-	+	-
Topic Initiator	TI	+	\pm	+	-	-
Reciprocal Question	RQ	+	+	-	-	-
Clarification	CL	+	-	-	\pm	+
Return to Old Topic	ROT	+	\pm	+	-	+

Table 1: Features of pragmatic categories

Elaborative Detail (ED): ([+], [-], [-], [-], [-]) This category picks out the use of questions that ask for elaboration on the current topic of conversation. Crucially, the FP value (second position) of ED questions is set to [-], which means that the interrogator is the Hearer ($I = H$). This means that Speakers are unable

to ask ED questions. ED questions are posed by addressees who are genuinely interested in the topic of the conversation (in contrast to DIF questions, see below).

- (3) [S has been speaking regarding a pending settlement through the court]
 S: You know on the uh you're sitting on the steps waiting for the judge
 and that's when they settle you know.
 H: yeah. wh- **when** when are you **going to court**?
 H* !H* H*LL%

(3) is an example of an ED question. Here, the topic of conversation is a court settlement case involving S. Let us examine this particular question with respect to the feature values of each of our five dimensions.

ED questions are always information seeking [IS: +]. That is, the use of a wh-interrogative as a request for elaboration on a particular topic is necessarily a solicitation for information. We have already noted that ED questions cannot be floor passing. They are [FP: -], since a request for details on an ongoing narration necessitates that it be a request made by the hearer. Taking (3) as an example, it is easy to see that it would be infelicitous for S to ask for an elaboration on the topic of the court decision with a question, since S is the source for this information. We can see that H does not claim the conversational floor with her question, since the question is a request for further elaboration from S. As such, ED questions are not floor passing.

It is also easy to see why ED questions are [TC: -], since they do not change the topic of the conversation. We also note that ED questions are not interruptive. For example, in (3) H asks a question at her own turn, i.e. the onset of H's question does not overlap with S's preceding utterance. Lastly, ED questions are [IR: -], which means that the propositional content of an ED question is not in the discourse record, i.e. it is not given.

Floor Deferring (FD): ⟨[+], [+], [±], [-], [-]⟩ This category picks out questions which are primarily used by a speaker as a strategy to pass the floor to the hearer. FD questions are information seeking and floor passing. We did not classify FD questions that changed the topic of conversation from those that did not, and so left the TC value underspecified. A particular subset of FD questions are Reciprocal Questions discussed below, where S responds to a question q, and passes the floor back to H by asking the same question q. We classified Reciprocal Questions separately, just as a measure to examine if their prosody was distinct from the more general pattern of FD questions. An example of an FD question is (4).

- (4) [S has been talking about a particular reality TV show]
 S: You know that probably men versus women could work [...]
 What **else** is out there?
 H*LL%

In (4), S uses her question as a strategy to terminate her turn and pass the floor to H. The question is broad enough to allow for the topic of conversation to

remain the same (the reality TV show under discussion), or change. We note that FD questions cannot be interruptive (this would require that the speaker interrupt herself), and that they are not in record.

Directing Information Flow (DIF): ⟨[+], [-], [+], [-], [-]⟩ This category picks out questions issued by a hearer as a strategy to control the topic of conversation. Two important features of DIF questions is that they are [FP: -] and [TC: +]. That is, the hearer does not attempt to take the floor with her question, but uses her question to change the topic of conversation. FD questions differ minimally from ED questions in their TC value. Whereas an ED interrogator appears interested in the topic of conversation and solicits more focused information, the DIF interrogators appear hesitant to remain on topic and controls the direction of information across various topics.

- (5) [S has been talking about several issues in her personal life as a response to various questions that H directs at S]
 S: I work ten at night to six in the morning. Bo Bo's happy because uh he don't have to go back to day care.
 H: **When** do you **sleep** then?
 H* L+H*LL%

(5) is an example of a DIF question in light of the preceding context. While the conversational topic is centred around random events and issues in S's life, every such information by S is an immediate response to a sequence of questions issued by H. However, unlike ED questions which request further elaboration on a distinct topic, DIF questions shift the topic of conversation. In (5), this shift in topic is one from S's work schedule to her sleep schedule.

Rhetorical (R): ⟨[-], [±], [±], [±], [±]⟩ This category picks out questions that are not information seeking. As mentioned above, so long as a question was [IS: -], we categorized it as a rhetorical question, regardless of its remaining four features. Our motivation for this category was to test whether the IS dimension alone had an influence on the prosody of wh-interrogatives. An example is (6).

- (6) [Following a pause in the conversation, S recollects her thoughts]
 S: **What** was I gonna **say**?
 L*+H H*HH%

(6) is an example of a rising wh-interrogative that is used as a 'question to self.' The question in (6) is [IS: -] as it is not used to solicit information from H. Rather, the question is used to manage turn-taking, by suggesting that S intends to maintain the floor, despite the pause in the conversation.

Supplementary Information (SI): ⟨[+], [-], [-], [+], [-]⟩ This category picks out questions that inquire about information with oblique relevance to the current topic. Such information may enhance H's engagement in the current topic by resolving side-issues that bear on the interpretation of the topic's main-point. SI questions are H's inquiries without the intention of taking the floor from S. SI questions are interruptive, as they arise with some urgency, given that the evaluation of the current topic will be contingent on the answer to their question. In

fact, SI questions differ from ED questions only in their interruptive value. As we will see in our results in the following section, SI questions are mostly rising in intonation.

- (7) [S has been worrying about *where* she could stay when she visits]
 S: But if not I mean I'm just coming anyway but I have no idea like
 where I'll go-
 H: **When** are you **planning** on **coming**?
 L*+H !H* L*HH%

In (7), the current topic under discussion is the question of *where* S will be staying when she visits. With her question, H interrupts S to ask *when* S is planning on visiting, implicating that the location where S will stay is contingent on when she will be arriving. That is, H requires the information to her question as a precondition for settling the issue of where S could stay.

Topic Initiator (TI): ⟨[+], [±], [+], [-], [-]⟩ This category picks out questions that set a new topic for conversation. TI questions are floor-neutral, and often appear at the beginning of the discourse. However, this need not be the case. In (8), for example, S has concluded her discussion regarding a certain letter S will be mailing to H. After a short pause, H raises the new topic set by the question in (8).

- (8) **How** are things **going** at the **college** with **Peg**?
 L*+H !H* L+H* H*LL%

Reciprocal Question (RQ): ⟨[+], [+], [-], [-], [-]⟩ This category is really a specific subset of FD questions, which we decided to categorize separately, given their very specific character. RQs are questions that S directs at H, just after S has finished answering the same question. (9) is an example.

- (9) [S has been answering the question, if he were to invent a holiday, what holiday would he invent?]
 S: **What** would you **invent**?
 L*+H H*LL%

(9) is an example of an RQ, given that the question S asks is the same question that he has been answering himself. RQs function as a strategy to pass the floor to the hearer, while retaining the same topic.

Clarification Question (CL): ⟨[+], [-], [-], [±], [+]⟩ This category picks out questions that are a request for a repetition of information that is already in the discourse record, but inaccessible to the interrogator. We found CL questions often to be interruptive, but they need not be. (10) is an example of a CL question, where H requests S to repeat a segment of the address that H could not register.

- (10) [S is citing an email address while H writes it down]
 S: ... dot H I T C
 H: **What's** after the **dot**?
 L*+H L*HH%

CL questions are prosodically interesting, as they are often produced with a terminal rise. We will return to this discussion in our results below.

Return to Old Topic (ROT): ⟨[+], [±], [+], [-], [+⟩ This category picks out questions that change the topic of conversation by returning to an older topic that the conversation had diverged from earlier in the discourse. We capture the difference between ROT questions and TI questions in their In Record value. We took this measure as a test to determine whether topic initiators differ in their prosody with respect to the novelty of the topic for that particular conversation.

- (11) [Following a digression from speaking about holidays]
 S: So, uh **what** do you **do** for **Christmas**?
 L*+H !H* H*LL%

This discussion concludes our description of the nine categories we used to classify the pragmatic function of our 200 *wh*-questions. We report the correlation result of the nuclear contour and pragmatic function of the questions in the section below.

3. Results

In this section, we first report our findings on the prosody of the *wh*-interrogatives from our corpus, and list their nuclear contours together with their frequency. We then look at the distribution of each nuclear contour within each of the pragmatic categories to investigate any possible influence of the discourse function of a question on the prosodic shape of its nucleus.

3.1 The nuclear contour

The distribution of the sentence-final nucleus of the 200 *wh*-interrogatives is shown in Table 2.

Nucleus	Number
High Fall	98
Rise Fall	50
Low Fall	14
Falls subtotal	162
Rise	31
Fall Rise	5
Rises subtotal	36
Level	2
Total	200

Table 2: Nuclear contours

Since we are dealing with a rather small population sample, we use descriptive labels to group together several ToBI tunes into one cell in the table. For

example, the label ‘High Fall’ corresponds to both $H^*L-L\%$ and $!H^*L-L\%$, and the label ‘Rise Fall’ corresponds to variants of $L+H^*L-L\%$. ‘Low Falls’ correspond to $L^*L-L\%$. A more detailed ToBI classification of this data can be found in Hedberg, Sosa, Görgülü and Mamani (2010). More generally, our results show that 162 or 81% of the 200 *wh*-interrogatives in this study occurred with a falling intonation. This finding confirms the common generalization in the literature that *wh*-questions tend to be falling. However, we also found that 36 or 18% of the questions occurred with a terminal rise. The rises comprise three variant contours, the ‘Low Rise’ ($L^*H-H\%$), the ‘High Rise’ ($H^*H-H\%$) and the ‘Fall Rise’ ($H^*LH\%$). If the default boundary tone associated with *wh*-questions is the $L\%$, it remains to be seen which factors, pragmatic or otherwise, can explain the $H\%$ observed in the 18% of our data. Below, we tabulate the frequency of each nuclear contour for each one of the pragmatic categories that we listed above. Our intention is to discover pragmatic predictors for the choice of one nuclear contour over another, and in particular, the difference between Falls and Rises.

3.2 Correlation of nuclear contour and pragmatic category

We were able to classify 196/200 questions according to the pragmatic categories described above, and left the remaining four questions unclassified. We summarize this result in Table 3.

Pragmatic Category	High Fall	Rise Fall	Low Fall	Rise	Fall Rise	Level	Total
Elaborative Detail	37	12	4	3	2		58
Floor Deferring	15	8		2		1	26
Directing Information Flow	14	11			1		26
Rhetorical	10	8	3	5			26
Supplementary Information	1		1	13			15
Topic Initiator	5	4	2	2	1		14
Reciprocal Question	9	2	1		1		13
CLarification	3	2		6		1	12
Return to Old Topic	2	2	2				6
UNclassified	2	1	1				4
Total	98	50	14	31	5	2	200

Table 3: Pragmatic category and nuclear contour correlation

As can be seen from Table 3, the greatest number of our questions occurred with a High Fall or a Rise Fall nuclear contour. These two categories together constitute 148/200, or 74% of the data. It is noteworthy to point out that the number of Rise Falls is consistently lower than the number of High Falls in every category. Beyond this generalization, however, we are unable to reach any pragmatic

conclusions with respect to the contrast in the use of *wh*-interrogatives with a High Fall versus a Rise Fall nuclear contour. This distinction will require a closer examination in a separate study.

The distribution of the Low Fall nuclear contour (L*LL%) in Table 3 is quite inconclusive. While there were 14 instances of this tune, their distribution does not seem very systematic. It remains to be seen whether Low Falls will show a stronger distribution pattern with a larger population sample.

Table 3 starts to look more promising as we begin to compare the distribution of the rising versus falling nuclear contours as a whole. First, we note that 36/200, or 18% of the questions occurred with a rising contour. More pointedly, 13/36 of these are SI questions (36%). Within the SI category, 13/15 (87%) occur with a terminal rise. Our data is therefore strongly suggestive that SI questions likely occur with a rise. We will return to a discussion of SI questions below.

CL questions comprise another category where the number of the rising contour is relatively high. Exactly half of our CL questions occurred with a rise (6/12, or 50%). Together, SI and CL questions constitute 19/31 (or 61.2%) of the rising contours. Of the remaining 12/31 rising questions, five are Rhetorical questions. This fact draws attention to a limitation in our study with respect to Rhetorical questions. In a further study, we will need to investigate those features of rising Rhetorical questions that distinguish them from falling ones in their discourse function, and compare them with rising questions in other categories. As for the remaining seven rising questions, their distribution seems fairly scattered.

Lastly, we point out that the occurrence of the Level nuclear contour in our data sample is negligibly low.

3.3 Discussion

The biggest question that arises for us at this point is, given the categorical design of our methodology, what can we conclude from the distribution of the rising vs. falling nuclear contour on *wh*-interrogatives? One suggestive piece of evidence that can be observed in our results is that the feature [INT: +] seems to be a factor in determining the rising contour. This is so, since the three categories that permit this feature, namely SI, R and CL, together constitute 24/36 (67%) of the rising contours. In fact, a closer look reveals a more suggestive result. We do not find an instance of a *wh*-interrogative that occurs with a Fall Rise in any one of the three mentioned categories. That is, all 24 instances of rising questions in these three categories occur with a Rise (which correspond to our ToBI categories L*H-H% and H*H-H%). We can safely then disregard Fall Rises in our account of the behaviour of Rises. That is, the prosodic feature of interest is the co-occurrence of the high phrase accent (H-) and the high boundary tone (H%). From this enhanced perspective, our results show that 24/31, or 68% of the rising contour (H-H%) comes from the three categories that permit the feature [INT: +].

In light of this evidence, we would like to suggest that ‘interruption’ may be one determining factor in the choice of a rising contour (L*H-H% or H*H-H%). However, this result is at best only suggestive. We wish to emphasize this

latter point for the following reasons. First, it is not clear to us that all instances of rising R or CL questions really are interruptive. That is, we do not think that [INT: +] is a necessary condition for the rising contour. Secondly, it seems to us that our five dimensions do not fully characterize SI questions. This is so, since SI questions differ from ED questions only in their [INT] value. But this is an over-simplification. In our description of SI questions, we noted that SI questions query information that is only indirectly relevant to a particular topic. As such, SI questions solicit information that the hearer requires as a precondition to process the content of S's narration. Thought of in this way, a complete characterization of SI questions would require a means to identify the relevance of the queried information to the topic of conversation along dimensions that we have not yet identified. Furthermore, it is far from obvious that questions of this kind would have to be interruptive.

One possible alternative analysis might take into consideration whether the question 'moves the discourse forward' along a given topic, or 'pauses' the conversation to gain background information before continuing. This approach seems promising, as it may correctly pick out the rising contour, but also elucidate why the [INT: +] feature correlates with the rising contour. We leave the pursuit of this approach for a future study.

4. Conclusions

Our paper has reported a corpus investigation, designed as an attempt to discover a correlation between the prosodic form and pragmatic function of *wh*-questions in natural discourse. Our study took a novel approach to determining the discourse pragmatic factors that influence the choice for the nuclear contour of *wh*-questions by testing five binary dimensions that seemed to us to play a determining role in the prosodic tune of questions. With respect to the five binary values assigned to each question, we classified our data according to nine categories that minimally contrasted from the others in one feature value. Our results have confirmed the common observation that *wh*-questions in English tend to be falling in intonation. However, our data further shows that the High Fall contour (H*L-L%, and variants) occurs more frequently than the Rise Fall contour (L+H*L-L%) across all pragmatic categories. More interesting is our finding that 18% of our data comprised *wh*-questions that ended in a high boundary tone (H%), as a Rise (L*H-H% or H*H-H%) or a Fall Rise (H*L-H%). Our data suggests that *wh*-interrogatives that end in a rising nuclear contour (L*H-H% or H*H-H%) are pragmatically distinct as a function of their feature to occur in 'interruptive' discourse environments. More generally, however, with the exception of rhetorical questions, *wh*-interrogatives that end in a Rise appear to query information that does not bear directly on the current topic of the discourse. This said, rising *wh*-interrogatives do not seem to change the discourse topic either. We would like to suggest that rising *wh*-interrogatives pose 'side-issues', which differ distinctly from the use of falling *wh*-interrogatives, which may function either to start a new topic, or else make a query on the main topic of conversation.

With respect to existing literature on the topic of interrogative intonation, previous accounts have made an effort to explain the contrast in the rising intonation of *yes/no* questions and the falling intonation of *wh*-questions. However, our data suggests that a complete theory of intonational meaning should further explain the contrast between rising and falling *wh*-questions. We have found some supporting evidence for Bolinger's (1989) claim that "reclamatory" questions tend to be rising. Reclamatory questions would seem to correspond to our Clarification questions since these "reclaim" information that is already in the conversational record, i.e. [IR: +]. However, our results also indicate that the function of a nuclear rise on *wh*-questions is broader than Bolinger suggested. That is, Supplementary Information questions, which do not "reclaim" old information, also tend strongly—in fact even more strongly—to be pronounced with a final Rise.

References

- Bartels, Christine. 1999. *The Intonation of English Statements and Questions: A Compositional Interpretation*. New York and London: Garland Publishing.
- Beckman, Mary, and Gayle Ayers-Elam. 1997. Guidelines for ToBI labeling, version 3.0. *The Ohio State University Research Foundation*.
- Boersma, Paul, and David Weenink. 2006. Praat: doing phonetics by computer [computer program] version 4.4.04. <http://www.praat.org/>.
- Bolinger, Dwight. 1989. *Intonation and Its Uses: Melody in Grammar and Discourse*. Stanford: Stanford University Press.
- Canavan, Alexandra, David Graff, and George Zipperlen. 1997. Callhome American English speech. Linguistic Data Consortium, Philadelphia.
- Cieri, Christopher, David Graff, Owen Kimball, Dave Miller, and Kevin Walker. 2004. Fisher English training speech. Linguistic Data Consortium, Philadelphia.
- Gussenhoven, Carlos. 1984. *On the Grammar and Semantics of Sentence Accents*. Dordrecht: Foris.
- Halliday, M. A. K. 1994. *An Introduction to Functional Grammar*. London: Edward Arnold.
- Hedberg, Nancy, Juan M. Sosa, and Lorna Fadden. 2006. Tonal constituents and meaning of *yes/no* questions in American English. In *Proceedings of Speech Prosody 2006*. Dresden, Germany.
- Hedberg, Nancy, Juan M. Sosa, and Emrah Görgülü. 2008. Early and late nuclei in *yes-no* questions: Tails or high rises? In *Proceedings of Speech Prosody 2008*, 229–232. Campinas, Brazil.
- Hedberg, Nancy, Juan M. Sosa, Emrah Görgülü, and Morgan Mameni. 2010. The prosody and intonation of *wh*-questions in American English. In *Proceedings of Speech Prosody 2010*. Chicago, Illinois.
- Pierrehumbert, Janet, and Julia Hirschberg. 1990. The meaning of intonational contours in the interpretation of discourse. In *Intentions in Communication*, eds. Philip R. Cohen, Jerry Morgan, and Martha E. Pollack, 271–311. Cambridge MA.: The MIT Press.
- Steedman, Mark. 2007. Information-structural semantics for English intonation. In *Topic and Focus: Cross-linguistic Perspectives on Meaning and Intonation*, eds. Chungmin Lee, Mathew Gordon, and Daniel Büring, 245–264. Dordrecht: Springer.