

# A Unified Account of the Meaning of English Questions with Non-Canonical Intonation

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In an ongoing corpus study of the intonation and meaning of 410 yes-no questions and 200 wh-questions in American English, we have previously confirmed that yes-no questions tend to rise and that wh-questions tend to fall. Here, we examine the meanings of the non-canonical yes-no questions that *fall* and wh-questions that *rise*. We have previously proposed that falling yes-no questions are non-answer-seeking, in that they are used e.g., for requests for action or indirect announcements. We also found that rising wh-questions are used as clarification questions and for questions seeking supplementary information. Here, we attempt an initial explanation for non-canonical question intonation in terms of Inquisitive Semantics. We propose that non-canonical intonation on questions signals that the question is to be understood as relatively non-inquisitive.

## 1. Introduction.

It has long been observed that yes-no questions in English tend to rise intonationally, while wh-questions tend to fall. We confirmed this pattern in two corpus studies of American English, reported on in Hedberg, Sosa & Fadden 2006 (for yes-no questions) and Hedberg, Sosa, Görgülü & Mameni 2010a,b (for wh-questions). In those papers we also reported on the apparent meaning conveyed by non-canonical intonational patterns on yes-no questions and wh-questions that distinguish such questions from those with the canonical pattern. In this paper we review those findings and attempt to develop a unified account of the meaning of both types of non-canonical intonational pronunciation. We get our inspiration for the unified account from Inquisitive Semantics (Groenendijk & Roelfsen 2009). In section 2 we describe the data, methods and results of the corpus studies, and in section 3 we develop our unified account.

## 2. Data, Methods and Coding Results.

The data for the two corpus studies comes from the Callhome Corpus of American English (Canavan et al. 1997) and the Fisher [American] English Corpus (Cieri et al. 2004), both available from the Linguistic Data Consortium. The Callhome corpus is a corpus of telephone conversations between people who know each other, and the Fisher Corpus is a corpus of telephone conversations between people who do not know each other. We searched the transcripts for instances of interrogative form yes-no questions and wh-questions, settling on a sub-corpus of 410 yes-no questions and a sub-corpus of 200 wh-questions. We then extracted the questions from the speech files and annotated them intonationally using the ToBI system for American English (Beckman & Ayers-Elam 1997). In a second stage of analysis, we consulted

the transcripts and classified the questions according to their meaning, following Banuazizi & Cresswell's (1999) criteria for genuine vs. non-genuine yes-no question meaning, and a system for classifying the pragmatic function of wh-questions devised by the last two authors of Hedberg, Sosa, Görgülü & Mameni 2010a,b. The prosodic annotation was done before the pragmatic coding to avoid biasing the prosodic annotation, and the pragmatic coding was done based solely on the transcripts and not taking into consideration the prosodic annotation. We used Praat (Boersma & Weenink 2006) to aid in the acoustic analysis. Early on in the project, we subjected our ToBI coding to an intercoder reliability study, as reported in Hedberg, Sosa & Fadden 2006. We found that the transcriber-pair-word agreement score for three coders was 75.7% on presence and type of pitch accent. We judged that such a result is typical for reliability results reported for ToBI annotation in the literature.

**2.1. Prosodic annotation results.** In studying the intonation of our questions, we were especially interested in the final, nuclear contours of the questions because this seems to be the major prosodic signal of question meaning. The results of the prosodic annotation for yes-no questions are shown in Table 1, and those of the wh-questions is shown in Table 2.

<b>Nuclear Contour</b>	<b>ToBI Category</b>	<b>Number</b>
Low rise	L*H-H%	325
	L*L-H%	2
High rise	H*H-H%	39
	!H*H-H%	5
Fall rise	H*L-H%	1
	L+H*L-H%	1
High fall	H*L-L%	9
	!H*L-L%	1
	L+H*L-L%	7
Low fall	L*L-L%	6
Level	H*H-L%	9
	!H*H-L%	3
	L*+HH-L%	2
<b>TOTAL</b>		<b>410</b>

Table 1. Nuclear Contours of Yes-No Questions

It can be seen from Table 1 that the vast majority of yes-no questions are pronounced with some kind of rise (373/410, or 91%). This confirms that yes-no questions tend to rise in American English. For a discussion of whether there is actually a meaning difference between low-rises (L\*H-H%) and high-rises (H\*H-H%), see Hedberg & Sosa (2011), who conclude that many of the high rises of Table 1 are actually nuclear low rises, which contain a high post-nuclear accent.

Table 2 shows that the majority of wh-questions in our corpus are pronounced with some kind of fall (162/200, or 81%). Again, this confirms claims made in the literature about the intonation of wh-questions in English.

<b>Nuclear Contour</b>	<b>ToBI Category</b>	<b>Number</b>
High Fall	H*L-L%	64
	!H*L-L%	34
Rise Fall	L+H*L-L%	44
	L+!H*L-L%	6
Low Fall	L*L-L%	14
Low Rise	L*H-H%	26
	L*L-H%	1
High Rise	H*H-H%	3
	!H*H-H%	1
Fall Rise	H*L-H%	2
Rise-Fall-Rise	L+H*L-H%	2
	L+!H*L-H%	1
Level	H*H-L%	1
	H*!H-L%	1
<b>TOTAL</b>		<b>200</b>

Table 2. Nuclear Contours of Wh-Questions

**2.2. Pragmatic coding results.** For yes-no questions, we classified the falling questions according to the categories of “non-genuine” vs. “genuine” question established by Banuazizi & Cresswell 1999 in their study of the Switchboard Corpus of American English. The Switchboard Corpus (Godfrey et al. 1992) is a corpus of telephone conversations between people who do not know each other. Banuazizi & Cresswell followed Hudson 1975 and Kenworthy 1978 in classifying questions that do not conform to the felicity conditions shown in (1) as non-genuine.

- (1) a. The speaker S must not already know, or believe she knows, the answer to the question she is asking the hearer H.  
b. S must desire a response from H.  
c. S must believe that H can provide a response.

They listened to 3,789 questions and found that 217 or 5.7% were falling. This compares almost exactly to our 23/410 falling questions, or 5.6%. They found that 191/217 falling questions were non-genuine, or 88%. We found that 22/23 or 96% were non-genuine. They also selected a sample of 237 rising questions and found that 57.8% of them were genuine. We too selected a random sample of 100 low-rise questions from our corpus and found that 88% were genuine questions. Table 3 shows the distribution of our falling and low-rise question sample across the subcategories of non-genuine and genuine questions that Banuazizi & Cresswell established.

Category of Question	Falling questions	Low rise questions
Expected response is something other than yes/no.	-	-
Introduction of the assigned topic.	-	-
Introduction of new topics within the conversation.	2	1
Requests couched in question form.	4	-
A particular response is clearly expected.	8	4
Discourse markers.	2	1
Conversation management.	-	-
Quoted or reported questions, or questions in citation form.	2	-
Questions followed immediately by another clause.	1	5
Correction question.	-	-
Jokes.	1	-
Information couched in question form.	2	1
Questions to self.	0	-
Genuine question.	1	88
<b>TOTAL</b>	<b>23</b>	<b>100</b>

Table 3. Pragmatic Categories of Yes-No Questions that Fall and Rise

Some examples of our falling, non-genuine questions are shown in (2)-(6). (2) is a request for action instead of information, (3) is an announcement (information couched in question form), (4) is a discourse marker, and (5) is an example of a question in which a particular answer is clearly expected as the speaker can hear that the addressee has a cold.

- (2) Can we **talk** about the **job** things now?  
H\*                      L\*L-L%
- (3) Did **I** **tell** you that **I** have a new **job**?  
L+H\* !H\*                      !H\*                      L\*L-L%
- (4) Is **that** right?  
L\*L-L%
- (5) Do you have a **cold**?  
H\*L-L%

We concluded from this study that yes-no questions have non-canonical, falling intonation when the speaker is not conforming to felicity conditions for questions, and thus that the meaning of the fall is pragmatic in nature.

For wh-questions we devised our own typology of pragmatic functions of wh-questions. The last two authors of Hedberg, Sosa, Görgülü & Mameni classified the 200 wh-questions in our corpus according to the dialogue function of the questions. They devised a system of binary features to classify each question along five dimensions, as summarized in (6)

- (6) a. Does the question seek information?
- b. Does the question result in the floor being passed to the other participant?
- c. Does the question serve to change the topic of conversation?
- d. Does the question interrupt the flow of the current speaker's turn?
- e. Is the propositional content of the question already in the conversational record?

After each wh-question was classified along these dimensions, seven subcategories of pragmatic questions could be established, as summarized in (7).

- (7) a. **Elaborative detail:** The question asks for elaboration on the current topic of conversation without changing the topic and without taking over the floor.
- b. **Floor Deferring:** The question is used to pass the floor to the other participant.
- c. **Directing Information Floor:** The question is used to change the topic of conversation without passing the floor to the questioner.
- d. **Rhetorical:** The question is not information seeking.
- e. **Supplementary Information:** The questioner interrupts the current speaker in order to ask for background information necessary to understanding the current topic.
- f. **Topic Initiator:** The question sets a new topic of conversation.
- g. **Reciprocal Question:** A subset of Floor Deferring questions, whereby the questioner asks the same question he was just asked back to the other participant.
- h. **Clarification Question:** The question asks for repetition of information that is already in the conversational record.

After classifying each wh-question into one of these seven categories, we compared the prosodic realization of the questions in the seven categories, as shown in Table 4. As an examination of this table shows, non-canonical, rising intonation is typically used for Supplementary Information questions (13/15) and often used for Clarification questions (6/12). These two categories account for 19/31 or 61.3% of rising wh-questions. The next most frequent category of rising questions is Rhetorical questions, adding 5 more to the rising question category. However only 5/26 (19.2%) Rhetorical questions rise.

The dimension of comparison that seems to best predict which questions are going to rise is the Interruptive dimension. Supplementary Information questions are always interruptive, Clarification questions typically are and Rhetorical questions may be interruptive. All of the other pragmatic categories of question were classified as necessarily [-Interruptive]. Examples of rising Supplementary Information questions are shown in (9) and (10), of rising Clarification questions in (11) and (12) and of a rising Rhetorical question in (13).

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			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
<b>TOTAL</b>	<b>98</b>	<b>50</b>	<b>14</b>	<b>31</b>	<b>5</b>	<b>2</b>	<b>200</b>

Table 4. Pragmatic Category and Nuclear Contour Correlation

- (9) [A has been worrying about where she could stay when she visits]  
A: But if not I mean I'm just coming anyway but I have no idea like where I'll go-  
B: **When** are you **planning** on **coming**?  
L\*+H                    !H\*                    L\*H-H%
- (10) A: ....And the director's in Detroit.  
B: Yeah, we're all in Detroit but the area directors um travel to the cities that the volunteers are in, and um you know meet with the communities and stuff like that.  
So-  
A: **What's** your **area** then?  
H\*                    L\*H-H%
- (11) [A is citing an email address while B writes it down]  
A: ... dot H I T C  
B: **What's** after the **dot**?  
L\*+H                    L\*H-H%
- (12) **Which** did you say you **preferred**?  
H\*                    L\*H-H%
- (13) [Following a pause in the conversation, A recollects her thoughts]  
A: **What** was I gonna **say**?  
L\*+H                    H\*H-H%

Except for the Rhetorical questions, these non-canonical, rising wh-questions are genuine questions in that they conform to the felicity conditions of genuine questions shown above in (1). That is, the speaker does not know the answer to the question, desires a response from the hearer,

and believes that the hearer can provide a response. Pragmatically, perhaps the rise serves to politely indicate that the questioner is not seeking to take the floor and that the interruption is necessary in order for the conversation to proceed.

However, in listening to rising wh-questions occurring in everyday life and on further examining the examples in the corpus, Hedberg & Mameni 2010 discovered a possible semantic function of wh-questions that are prosodically non-canonical because they rise. In the next section we explain this semantic function and seek to extend it to the non-canonical, falling yes-no questions.

### 3. A Semantic Explanation for Non-Canonical Question Intonation.

As background, note that Hamblin 1973 analyzed the semantic denotation of a question as the set of its possible answers, i.e. a set of propositions, each of which is an answer to the question. A proposition is viewed as a set of possible worlds. For a yes-no question, this means disjointly partitioning the set of possible worlds into two: those in which the proposition is true and those in which it is not. For a wh-question such as “Who called?”, where the set of alternative answers in the context is being assumed to be Peter, Bill and Mary, the question consists of three possibly overlapping sets of worlds, those in which Peter called, those in which Bill called, and those in which Mary called. Note that the set of possible answers to a wh-question is generally constrained by the context.

**3.1. Rising wh-questions.** Hedberg & Mameni 2010 suggested that the general meaning of rising intonation on wh-question is to convey that the set of possible answers actually under consideration is relatively small compared to the set that could be assumed to be under consideration given the syntactic form of the question and the context. Consider the constructed context in (14). (14a) and (14b) both convey that the questioner has no information about the name of the new secretary. A rising question is possible in (14b), which conveys perhaps that the questioner used to know but has forgotten, and thus is using the question as a request to remind him of the answer. This type of partial information is not possible in (14d) because there the questioner is just learning about the new secretary. A rising question is infelicitous here. The final rise seems to indicate that the questioner has partial information.

- (14) Did you hear? We have a new department secretary.
- a. Yes, I heard. What’s her **name**? ↓
  - b. Yes, I heard. What’s her **name**? ↑
  - c. No, I didn’t hear. What’s her **name**? ↓
  - d. # No, I didn’t hear. What’s her **name**? ↑

It can likewise be seen from (15) that the rising wh-question is compatible with a context where the questioner has some knowledge as to the name of the new secretary, whereas the falling wh-question in (16) is not felicitous in that context.

- (15) A. Did you hear? We have a new department secretary.  
B. Yes, I heard. What’s her **name**? ↑  
A. Gina.  
B. No, that’s not it. It starts with an S.

- (16) A. Did you hear? We have a new department secretary.  
 B. Yes, I heard. What's her **name**? ↓  
 A. Gina.  
 B. # No, that's not it. It starts with an S.

Hedberg & Mameni pointed out that even in the case of clarification questions, as in (11), repeated from above, the questioner has some idea of what the addressee had said—thus the set of possible answers again is not wide open.

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

Thus, in (17), speaker B can object to A's answer to his rising echo wh-question, on the grounds that A's new answer does not fit the partial information that B had arrived at earlier about the answer.

- (17) A: I visited Tokyo.  
 B: **Where** did you **visit**? ↑  
 A: London.  
 B: That's not what you said!

That is, B is saying that he is not sure of what he heard of the first time, but he knows that it was not London.

In the Supplementary Information question in (9), repeated below, speaker B has some idea of when A is coming, but needs to know exactly when she is coming in order to be able to answer the question of where she should go, e.g. to find a hotel.

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

And, in (18), an attested example we heard in everyday life outside of the corpus, the speaker conveyed that he is familiar with the psychology faculty at York. (We were able to ask the speaker of this question whether he intended to convey this, and he confirmed it.) The speaker had just been introduced to the addressee, and thus was not asking to be reminded of the answer. Instead the question conveys that the set of possible answers is relatively reduced from what the set of answers would normally be understood as conveying. Again, the questioner has partial information as to the answer.

- (18) **Who** did you **work** with at **York**?  
     L+H\*                      !H\*                      L\*L-H%



This is not a Supplementary Information question because it does not interrupt the other speaker. It is an Elaborative Detail question, but is still pronounced with rising intonation, we suggest, due to the implication of partial information.

As suggested in Hedberg & Mamani 2010, the compositional denotation of the terminal wh-question rise can thus be viewed as shown in (19a), which conveys the information shown in (19b) when applied to the question in (14):

- (19) a.  $\llbracket \uparrow \rrbracket = \lambda Q_{\langle \langle st \rangle \rangle} . \lambda R_{\langle \langle st \rangle \rangle} . R \subseteq Q$   
 b.  $\llbracket \text{What's her name? } \uparrow \rrbracket \subseteq \llbracket \text{What's her name? } \downarrow \rrbracket$

That is, the rising intonation pattern can be seen as signaling that the denotation of the question expressed semantically by the sentence should be mapped to a question with a more restricted domain of possible answers, and that it is this more restricted question that is actually being asked.

The idea expressed in Hedberg & Mamani 2010 that non-canonical question intonation might be explained in terms of the semantics of questions led us to explore recent theories of question semantics. Inquisitive Semantics (Groenendijk & Roelofsen 2009) is a new theory of dynamic semantics that deals with how different types of sentences, including especially questions, update the common ground. Traditionally, a proposition is viewed as a set of possible worlds, and a question (according to Hamblin semantics) constitutes a set of propositions, i.e. a set of sets of possible worlds. In Inquisitive Semantics a proposition is viewed as a set of possibilities, where each possibility consists of the set of possible worlds in which that possibility holds (i.e. is true). Thus a proposition is a set of sets of possible worlds. Each possibility corresponds to a way to update the common ground. A proposition, then, constitutes a proposal to update the common ground in one or more ways. An utterance is “inquisitive” if the proposition it expresses allows for more than one way to update the common ground, and an appropriate response will establish one of the proposed updates. An utterance is “informative” if it narrows down the set of possibilities.

Questions then, are normally inquisitive, because they introduce into the context more than one way for the other participants to update the common ground. Disjunctions are viewed as “hybrid” utterances because they both restrict the common ground to be compatible with the conveyed choices and thus are informative, but also still leave a choice open and thus are inquisitive.

We suggest that Inquisitive Semantics might be an enlightening theory in which to view the semantic role of non-canonical question intonation in dialogue. Although Inquisitive Semantics has so far concentrated on yes-no questions, we suggest that it is consistent with our account here to view the production of a wh-question with non-canonical intonation as conveying that the update to the common ground being proposed is relatively non-inquisitive compared to what it would have been like if pronounced with canonical intonation. The addressee of a rising wh-question is being requested to select from a set of ways to update the common ground that is reduced relative to the set of updates that would be understood as being offered for consideration by a falling wh-question in that context.

**3.2. Falling yes-no questions.** We proposed in the last section that rises on wh-questions signal that the question being conveyed is relatively non-inquisitive compared to what it would

mean if it were produced with falling intonation. We suggest in this section that our account of the relative non-inquisitiveness of wh-questions with non-canonical intonation (rising) can be extended to yes-no questions with non-canonical intonation (falling). Consider the examples of falling yes-no questions, shown in (2)-(5), repeated from above.

- (2) Can we **talk** about the **job** things now?  
           H\*                  L\*L-L%
- (3) Did **I** **tell** you that **I** have a new **job**?  
           L+H\* !H\*          !H\*                  L\*L-L%
- (4) Is **that** right?  
           L\*L-L%
- (5) Do you have a **cold**?  
           H\*L-L%

If (3) were used inquisitively, the speaker would evoke two possible ways of updating the common ground: “I told you that I have a new job”/“I didn’t tell you that I have a new job”. The fall conveys that the utterance is informative, i.e. an announcement instead of a question, so that the instruction is simply to add “I have a new job” to the common ground.

Similarly, (2) is used as a request for action rather than a question. It has the illocutionary force of a polite imperative. It thus conveys a single way of updating the common ground, by adding “we talk about the job things now” to the hearer’s “plans set” (Han 2000). Thus, falling intonation conveys that only one possible state-of-affairs is being proposed, with the resulting proposal to update the common ground being non-inquisitive.

Discourse markers like (4) make a comment about the previous conversational contribution and do not establish a choice between two alternative propositions in the common ground. And finally (5) is more an observation than a question since the questioner already knows the answer to the question. Its utterance simply conveys that the speaker is aware that the addressee has a cold and it is this acknowledgment of mutual awareness that is being placed in the common ground.

#### 4. Conclusion.

We have proposed that non-canonical, falling intonation on yes-no questions signals that the question is relatively non-inquisitive in that it is not seeking a choice between the positive and negative possibilities conveyed by its form. Instead the question is being used to e.g. make an assertion or to issue a request for action. Non-canonical wh-questions are rising, and convey that the question is relatively non-inquisitive, in that a relatively small set of answers is under consideration.

Our approach to the meaning of questions with non-canonical compared to canonical intonation is compatible with approaches to the semantics of questions and question intonation that can be found in the literature. For example, we can agree with Bartels 1999, who says that canonical wh-questions are falling because the presupposition of the question is being asserted,

and assertion is the primary meaning of falling intonation. This accounts for the canonical intonation of wh-questions. We can assume that this is the meaning that is primarily conveyed by the syntactic form of the wh-question, but that intonation only canonically matches it. We then simply have to add that the inquisitiveness-value of the resulting question is reduced when non-canonical intonation is applied.

We have said that canonical rising intonation on syntactically interrogative yes-no questions signals that a choice is being proposed between two alternatives. Inverting the intonation reverses inquisitiveness. Gunlogson 2003 discusses utterances with rising intonation that have interrogative force but that are syntactically declarative. Her claim is that such utterances are declarative in form because the speaker is signaling her view that the addressee is committed to the truth of the corresponding proposition, even though such sentences are interrogative in illocutionary force in that the speaker is not aware of whether that proposition is true or false. We could say that inverting the canonical falling intonation of declarative-form sentences by producing them with rising intonation again signals a reversal in inquisitiveness, this time producing an inquisitive utterance out of a syntactic form that is canonically non-inquisitive.

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