The Meaning of Intonation in Yes-No Questions in American English: A Corpus Study

NANCY HEDBERG, JUAN M. SOSA, AND EMRAH GÖRGÜLÜ

Abstract
In order to investigate the distinct nuances of meaning conveyed by the different intonational contours encountered in yes-no questions in English, we conducted a corpus study of the intonation of 410 naturally occurring spoken interrogative-form yes-no questions in American English. First we annotated the intonation of each question using ToBI and then examined the meaning of each utterance in the context. We found that the low-rise nuclear contour (e.g., L*H-H%) is the unmarked question contour and is by far the most frequently occurring. Yes-no questions with falling intonation (e.g. H*L-L%) do not occur frequently, but when they do, they can be classified in speech act terms as "non-genuine" questions, where one or more felicity conditions on genuine questions are not met. Level questions (e.g., L*H-L%) tend to be "stylized" in meaning and pattern with falling questions in being non-genuine. We also found that the pitch accent on high-rise questions (e.g., H*H-H%), where the final pitch contour starts high and ends higher, tends to mark information that is given in the discourse or a function word. These are syllables that would normally remain unaccented parts of the post-nuclear "tail" of the intonation phrase. This leads us to propose that many such accents are "post-nuclear accents" in the sense of Ladd 2008.

Key words: intonation; yes-no questions; ToBI; intonational meaning; American English; corpus study

1.   Introduction

1.1.   *The primary interrogative yes-no question contour in American English*

It is so widely acknowledged as to be almost obvious that yes-no questions in both British and American English mostly end in a rising contour. Nonetheless, in a study of the Survey of English Usage corpus of British English (Svartvik and Quirk 1980), Geluykens (1988) challenges this assumption. Although he concluded that 82 out of 156 (52.6%) interrogative questions were rising in intonation (Rise, Fall-Rise or Fall + Rise) compared to non-rising (Fall, Rise-Fall, Level), he claimed that the most frequent nuclear contour on yes-no questions employing the interrogative form (i.e. subject-auxiliary inversion) was a Fall. However, he defined his questions as ending at the point where it becomes clear that the addressee recognizes that the speech act is a question and begins to answer it. This happened very often before the question itself came to a close.

For example, Geluykens considers the question in (1)[1]:

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[1] Geluykens follows the notation system of Crystal (1969). The grave accent (' `') indicates a Nuclear Fall and the acute accent (' ́') indicates a Nuclear Rise. '#' indicates a Tone Unit boundary. '/' indicates an Onset (the first pre-nuclear pitch-prominent syllable in a Tone Unit). The straight accent (' ̄') indicates a non-nuclear stress (although it is not clear why this marker occurs on 'do', which is also marked as nuclear). A period ('.') indicates a very short pause. Asterisks ('*') indicate overlapping speech, and double parentheses ('((…))') indicate untranscribable syllables.

(1)	A: */does he 'dò it all # be/fore the 'term *stárts # ((for the/whole))**
	B: **I expect it's the .** kind of material he gets* (S.1.4.699)

He says, "The Rise on *starts* is the final Nucleus of the interrogative; however, the hearer has apparently decided on the Question status of A's utterance before hearing this Rise, as he begins to formulate an Answer while A is still talking. The relevant tone, therefore, from our point of view, is the Fall on *do.* Every time such overlapping of Question and Answer occurs in the data, we have taken the final tone to be the Nucleus occurring before the overlapping sets in." (Geluykens 1988: 473). We reject this reasoning because we maintain that the question contour should be measured at the point where the speaker projected ending the question, i.e. at the end of the question, whether or not the addressee has anticipated the content of the question before it ends, and thus begins to answer it early.

By contrast, the vast majority of other authors conclude that yes-no questions are typically rising in both British and American English. For example, Geluykens cites Kingdon (1958), Halliday (1967), and O'Connor and Arnold (1973) for this assertion, and more recently, we can identify Cruttenden (1986, 1997), Pierrehumbert and Hirschberg (1990), Ladd (1996), and Gussenhoven (1983, 2004), inter alia. In our American English data we found that 371/410 (90.5%) interrogative form yes-no questions were rising (low-rise or high-rise) as opposed to falling (low-fall, rise-fall, or high-fall), fall rising, or level. Our first major claim in this article is thus that yes-no questions in American English are primarily rising.

While there is overall broad agreement that yes-no questions in both British and American English tend to be rising, there is a surprising lack of agreement on what type of rising contour is most often associated with yes-no questions in the American dialect group. Pierrehumbert and Hirschberg (1990) state that L*H-H%[2] is the primary question contour in American English, but Cruttenden (1997: 59) states that the high-rise question contour is "much more frequent in American English than in British English", implying that it is frequent in American English. In the Tone and Break Indices intonation annotation system (ToBI), the high-rise contour is represented as H*H-H%, and Gussenhoven (2004: 297-298), citing Cruttenden (1997) and Bolinger (1998), concludes that the high-rise interrogative contour (his H* H) "is common in American English." As will be discussed in section Section 3, our findings support Pierrehumbert and Hirschberg (1990) in that we found many more low-rise (327/410, 79.8%) than high-rise (44/410, 10.7%) final question contours in our American English corpus. Our second major claim is thus that the primary rising contour on American English yes-no questions is the low-rise rather than the high-rise.

The article is laid out as follows. In the following subsection, we discuss the meanings attributed in the previous literature to intonation in general, before turning to the methodology we used in our corpus study in Section 2, and the results of our study of the distribution and meaning of all the attested nuclear yes-no question contours in Section 3. In Section 4, we discuss the occurrence of "tails" in our data–i.e. unaccented words following the nuclear accent, and we relate the meaning of high-rises to tails. We propose there that many of the tones that we annotated as high pitch accents (H*) in our high-rise final contours are actually edge tones (phrase accents) associating with stressable syllables in the post-nuclear rising portion of the

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[2] As will be explained in Section 2.1, in the Tones and Break Indices system (ToBI), '*' indicates a "pitch accent" tone, '-' indicates an intermediate phrase edge tone (a "phrase accent"), and '%' indicates an intonation phrase edge tone (a "boundary tone").

question contour. This constitutes the third major claim of this article. In Section 5, we briefly conclude.

In this study, we restricted our attention to positive yes-no interrogative-form questions because they are semantically simpler than negative interrogative yes-no questions and tag questions, which are associated with an assumption that the speaker or the hearer takes a proposition for granted (Ladd 1981, Romero and Han 2004). Similarly, declarative questions (i.e. declarative-form utterances without subject-auxiliary inversion but which are used as questions) are associated with an assumption that the addressee takes a proposition for granted (Gunlogson 2002). While it would be interesting to also examine these other types of yes-no questions, we decided to start with semantically simpler questions, and thus only analyzed positive yes-no questions exhibiting subject-auxiliary inversion.

1.2. *General studies of the meaning of nuclear contours in English*
In this section, we describe previous approaches to and claims about the meaning of English intonation contours in general. We characterize the theorists' overall systems of intonational meaning and describe how their analysis of yes-no question contours fits into them. This research has not used corpus data. Instead, the analysts rely on their intuitions as to the meaning of constructed examples with different intonation contours. Thus, they do not consider the wide variety of different contours that we found in our corpus data. The discussion in this section will serve as background for our more detailed discussion in Section 3 of predictions that these different theories make concerning the meaning of the different yes-no question contours that we found in our data.

Most early work on the meaning of intonation in English pertained to British rather than American English, but we talk about such approaches here because they serve as background for analysis of American English too. A first type of research on the meaning of intonation concentrated on characterizing the meaning of different nuclear contours as a whole, or even patterns extending over whole sentences or intonation phrases. For example, O'Connor and Arnold (1973) classify patterns of intonation into ten "tone groups" that are each composed of a distinctive combinations of pre-head, head and nucleus, and can each be applied to different sentence types such as statements, yes-no questions and wh-questions. They give evocative names to these tone groups, such as "Switchback", "High Dive", "Low Bounce", and characterize their meanings in terms of speaker attitudes that they convey, such as "surprise", "skepticism", "disapproval", "genuine interest" and "astonishment".

A second group of British-School analysts view the different nuclear contours as distinguishing different information structures or different relationships between the knowledge states of speaker and hearer. Thus, Halliday (1985: 281-282) relates the meanings of his five [nuclear] "tones" of English to mood. A falling tone (associated with statements and wh-questions) is claimed to indicate "polarity known"; whereas a rising tone (associated with yes-no questions) indicates "polarity unknown", and a level tone neutralizes this distinction. A falling-rising tone (associated with reservations and conditions) indicates "seems certain, but turns out not to be", and a rising-falling tone (associated with contradictions) indicates "seems uncertain, but turns out to be certain."

Brazil (1975) associated falling nuclear contours with the meaning "proclaiming", for which Gussenhoven (1983) adopted the term "addition" and characterized in Gussenhoven (2004) as "the speaker intends to establish his message as forming part of the common

knowledge shared by speaker and hearer."[3] Brazil associated fall-rise contours with the meaning "referring", for which Gussenhoven (1983) adopted the term "selection" and characterized in 2004 as "the speaker refers to knowledge, or wishes to be understood as referring to knowledge, already shared by him and the listener." Brazil associated rising contours (specifically our low-rise, his "high-rise"[4]) with the meaning, "intensified referring", for which Gussenhoven (1983) adopted the term "testing" for his L*H H_i.[5] Gussenhoven (2004: 299) says that this contour "leaves it up to the listener to decide whether the message is to be understood as belonging to the background," so that in yes-no questions, "the speaker invites the listener to resolve the issue."

Recent work on American English has followed this information-structural approach to intonational meaning, but has adopted an autosegmental-metrical approach to intonation description, following e.g. Pierrehumbert (1980) and the later ToBI ("Tones and Break Indices") system of intonation annotation (Silverman et al. 1992, Beckman and Ayers-Elam 1997). Thus, Pierrehumbert and Hirschberg (1990) proposed that tunes made up of constituent high and low tones should be interpreted compositionally. They posited distinctive meanings for the high, low and bitonal pitch accents (H*, L*, L+H* and L*+H), the high and low phrase accents (H- and L-) and the high and low boundary tones (H% and L%).[6] They proposed that H* indicates information that should be treated as "new" in the discourse in that "intonational phrases whose accents are all H* appear to signal to H[earer] that the open expression is to be instantiated by the accented items and the instantiated proposition realized by the phrase is to be added to [the] H[earer]'s mutual belief space" (p. 290), while L* "marks information that [the] S[peaker] intends to be salient but not to form part of what [the] S[peaker] is predicating in the utterance" (p. 291). L+H* and L*+H are used to "convey the salience of some scale…linking the accented item to other items salient in the H[earer]'s mutual beliefs." (p. 294). The high phrase accent (H-) and high boundary tone (H%) indicate that the intermediate phrase or intonational phrase marked by these tones is to be interpreted in relation to a later phrase of the same type, as compared with a low phrase accent (L-) or low boundary tone (L%), which indicate that the phrase so marked is to be interpreted separately. The typical L*H-H% yes-no question contour can thus be seen as specifying information that the speaker does not want to predicate as new information in the context, and which should be interpreted with respect to what follows, e.g., perhaps, the answer. The typical H*L-L% statement contour, on the other hand, does predicate new information and the intonational phrase should be interpreted as complete in itself.

This approach dovetails nicely with recent work in formal semantics where the meaning of a linguistic expression is viewed as the role it plays in changing the context, e.g. in modifying the common ground between speaker and hearer by means of adding a proposition or subtracting

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[3]Pierrehumbert & Hirschberg (1990:284) credit Gussenhoven (1983) with first characterizing the meaning of nuclear contours "in terms of the status of information with respect to a shared 'background,' which is developed by speaker and hearer during the course of a conversation," but Gussenhoven (2004) credits Brazil (1975) for this.

[4]Gussenhoven (2004: 320, note 1) cautions that, unlike here, the term 'high-rise' is sometimes used in the British tradition for L*H-H% as well as H*H-H%. He says, "In British English usage, 'low-rise' refers to a contour which does not rise a great deal, due to a reduced pitch span; or to a contour to be described later as the 'low low-rise'…. Brazil's [1975] meaning of his 'low-rise', i.e. a low-rise with reduced pitch range, was that of 'neutrality', of a withdrawal from the informational interaction."

[5]Gussenhoven here uses L*H to denote a bitonal pitch accent. Note also that he does not posit phrase accents in intonation phrase final position.

[6]Pierrehumbert and Hirschberg (1990) also discuss the meaning of H*+L% and H+L* pitch accents. In the ToBI system, the former was replaced with H* followed by a downstepped !H*, and the latter was replaced by H+!H*.

a proposition. Many of these accounts are interactive in that the changing individual information states of both speaker and hearer as well as the changing common ground are modeled. Thus, Bartels (1999) (also analyzing American English) refines the Pierrehumbert and Hirschberg (1990) account but locates the crucial difference between question and statement in the phrase accent of the ToBI annotation system, proposing that the L- phrase accent, prototypically present in declarative statements, alternative questions, and wh-questions, as well as in atypical falling yes-no interrogative questions marks 'speaker assertiveness' (Stalnaker 1978), whereas the H- phrase accent present in rising yes-no interrogative and declarative questions denotes the absence of this meaning. 'Assertiveness' here means that the speaker expresses an instruction to the addressee to commit himself publicly to the proposition or presupposition expressed. For Bartels, the L* pitch accent marks an entity as being (believed by the speaker to be) "already evoked and salient for the listener" [p. 57], whereas an H* "has the purpose of *making* the entity salient" [p. 57]. The H% boundary tone conveys the meaning of 'continuation dependence,' whether this is an implication that a following answer is expected in the case of a question, a following rectification in the case of a contradiction, or the reinforcement of a scalar implicature in the case of certain fall-rise declarative statements, to give a few examples.

Gunlogson (2002) focuses on falling and rising declarative-form sentences in American English, comparing both with rising yes-no interrogative-form sentences, and concludes that the declarative form expresses commitment to the propositional content, with pitch movement marking an interactional distinction between commitment by the speaker for falling declaratives (i.e. assertions) and by the addressee for rising ones (i.e. declarative questions).

Steedman (2000, 2007) (a speaker of British English) further extends the interactional meaning of intonational shape to all sentence types, but locates the interactional difference in the boundary tone, by proposing that H-, H-H% and L-H% rising contours always indicate hearer commitment to the proposition evoked by the utterance, while L-, L-L% falling contours and H-L% level contours indicate commitment by the speaker. For him, the bitonal pitch accents, L+H* and L*+H, indicate the information-structure unit of 'theme' ("the part of the sentence corresponding to a question or topic that is presupposed by the speaker", p. 246), while the monotonal pitch accents, H* and L*, indicate the 'rheme' ("the part of the utterance that constitutes the speaker's novel contribution on that question or that topic", p. 246). A second dimension of meaning defined upon the pitch accents is whether or not the speaker attributes to an information unit the property of being agreed upon by both speaker and hearer (H*, L+H*) or of being contentious (L*, L*+H). Typical low-rise (L*H-H%) and high-rise (H*H-H%) yes-no interrogative question contours would thus be characterized as indicating a proposition that the hearer as opposed to the speaker is committed to knowing the truth value of, and in both cases the information unit at the end of the utterance is indicated to be rhematic as opposed to thematic. The low-rise contour would indicate a contentious rheme, which could be explained if 'contentiousness' can be extended to include speaker uncertainty about whether the questioned proposition obtains. Likewise, the high-rise would indicate a non-contentious or agreed-upon rheme, which could be explained in our analysis, detailed below in Section 4.2, if 'non-contentious' can be extended to include information that is part of the question but is nonetheless 'given', e.g. referents that are already activated.

As mentioned above, the data considered by all of the theorists discussed in this section, from British School attitudinal analysts through formal semantic analysts, have been constructed data, with analysts' intuitions as to the meaning of sentences and contexts of utterance providing the basis for semantic or pragmatic generalizations. Our primary goal, in the present research,

was to put these claims and analyses to the test on actual spoken data, obtained from a corpus study of interrogative yes-no questions in American English, in which we both carefully transcribed the prosody of yes-no questions using ToBI and analyzed the meaning of the questions in the contexts provided and inferred from the transcript. We find a wider variety of different intonation contours on the yes-no questions in our data than the analysts just discussed address. After a brief description of our methodology in the next section, we turn in Section 3 and Section 4 to extensive discussion of our data and to how well theories of intonational meaning, including the approaches just outlined, can account for it.

2. Method

Our goal was to study the relationship between the intonational structure of American English yes-no interrogative questions and the meanings they convey as they occur in actual discourse. 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 English Corpus (Cieri et al. 2004), a corpus of ten-minute conversations on assigned topics between people who do not know each other. We chose to use telephone corpora because the recordings are clear and can be separated into two tracks for acoustic analysis. The first 104 questions from CallHome were annotated according to the ToBI system by the three authors of Hedberg et al. (2006). A second group of 231 questions from CallHome were subsequently annotated for ToBI categories by the first two authors of the current article, and the final group of 75 questions from the Fisher Corpus was annotated by the second and third author.[7] In total we have 410 questions. As mentioned above, only positive yes-no questions with the syntactic form of interrogative sentences were annotated and analyzed.

2.1. *Annotation*
We followed ToBI in annotating pitch accents, phrase accents and boundary tones. ToBI is a system for transcribing the intonation patterns and other aspects of the prosody of American English utterances. The intonational analysis of an utterance consists of labels for distinctive pitch events, transcribed as a sequence of high (H) and low (L) tones marked with diacritics indicating their intonational function as pitch accents or edge tones. We coded for five pitch accents: H*, !H*, L*, L+H*and L*+H, two phrase accents: L- and H-, and two boundary tones: L% and H%. We also annotated for downstep (!H*). Our phonological analysis follows the ToBI guidelines quite closely, but we have supplemented ToBI categories with a category of "upstep" (annotated as ¡) and "increased range" (annotated as ↑) when such annotation seemed

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[7] While question strategies among strangers may differ from those used among people who know each other, and we will note below particular types of questions that seem limited to one of the two corpora, we wanted to include more questions than were available in the CallHome Corpus, and we wanted to get a sense of whether the patterns we detected in that corpus would extend to another telephone corpus. We are certainly interested in the use of questions in other settings, such as those recorded in the Santa Barbara Corpus of Spoken American English (DuBois et al. 2000-2005) but we found that the audio recordings in that corpus were not of sufficient quality for instrumental analysis. We thank a reviewer for raising this question.

warranted.[8] We used Praat (v. 4.4.04) (Boersma and Weenink 2006) and Pitchworks (v. 8.9.5.5) 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.

In addition, in referring to some aspects of the overall contour of the intonational phrase, we follow Ladd (1996, 2008) in using the terms 'nucleus' and 'tail' from traditional British school analysts. O'Connor and Arnold (1973), for example, divide an intonational phrase into 'nucleus' (the final accented syllable, 'tail' (unaccented syllables after the nucleus), 'head' (all syllables before the nucleus, starting with the first accented syllable, and 'prehead' (unaccented syllables before the head).

2.2. *Reliability study*
In order to be certain that our analysis of the data was as precise as possible, our group conducted a reliability study early on in our research. As reported in Hedberg et al. (2006), for the training phase, we selected 48 positive yes-no questions from the CallHome corpus. The purpose of this phase was to learn to reliably code ToBI categories. Together we listened to each example and examined pitch tracks and came to a consensus on the appropriate tonal notation for each. We took notes on how decisions were made so that we could refer back to them later.

The second phase involved each of the three members' independent coding of 56 positive yes-no questions. We calculated transcriber-pair-word agreement[9] by comparing the labels of each transcriber against the labels of every other transcriber. If all three pairs agreed, we gave the word a score of 1. If two out of three pairs agreed we gave it a score of .33. If none agreed, we gave it a score of 0. Agreement was calculated three different ways. First, we calculated whether we agreed on pitch accents and terminal contours, and we agreed in 72% of the cases. Second, we calculated the presence and type of pitch accent, and agreement was 75.7%. Third, we calculated the agreement of the presence or absence of pitch accent, and agreement was 85.3%.

Our results compare about equally with previous studies reported in the literature on ToBI annotation. Using a variety of read and spontaneous speech, Pitrelli et al. (1994) report 68% agreement on particular pitch accent or no pitch accent, and 80.6% agreement on presence or absence of pitch accent. In a study on German ToBI, Grice et al. (1996) report 71% agreement on particular pitch accent or no pitch accent, and 87% on presence or absence of pitch accent. Syrdal and McGory (2000) calculated agreement for one professional male and one professional female speaker. They reached 71% and 72% agreement for the female and male speaker, respectively, for particular pitch accent or no pitch accent. They report 92% and 91% agreement for the female and male speaker for presence or absence of pitch accent. In a study using ToBI-Lite on samples from the Switchboard Corpus (Godfrey et al. 1992), Yoon et al. (2004) report agreement of 85.6% for particular pitch accent or no pitch accent, and 86.6% for presence or absence of pitch accent. In Safarova and Swerts (2004), reliability on declarative questions in the Santa Barbara Corpus of American English (DuBois et al. 2000-2005) was 47% agreement for particular pitch accents using full ToBI, and 87% using ToBI-Lite.[10]

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[8] Note that a symbol for 'upstep' ('ˆ') is used in GToBI (German ToBI) to mark cases where there is a step up to the peak on the nuclear syllable after a series of downsteps, and also to mark cases where a sequence of pitch accents involves a step up in pitch (e.g. in emphatic pitch). For discussion, see Grice, Baumann and Benzmüller (2005: 66).
[9] A reviewer asks why we didn't use established reliability coefficients such as Cohen's κ or Fleiss's κ, which correct for chance agreement. The answer is that we wanted to be able to compare the reliability of our team's coding with the other reliability studies of ToBI annotators, which reported transcriber pair-word agreement.
[10] The authors explain ToBI-Lite as follows: "all downstepped accents were matched with their nondownstepped version and all complex pitch accents with the prominent (monotonal) pitch accent…e.g., L+H* with H*, H+!H*

Once pairwise agreement had been calculated, we worked collectively to arrive at a consensus for the final coding of the test questions. After that, we recoded the training data for inclusion in our study. By then, we felt confident about the reliability and validity of our coding categories. Now that the current team has coded 306 more questions together, we feel even more confident that we have arrived at a reliable system of tonal coding. After performing the tonal annotations, we examined the transcripts to ascertain possible semantic and pragmatic conditioning of these patterns. We did the phonological analysis before we did the semantic/pragmatic analysis, thus avoiding circular reasoning.

In addition to challenges in achieving inter-coder reliability for our tonal annotation, we found we had some problems with intra-coder reliability, as we went back and listened to speech files already annotated. In some cases, we discovered that we no longer agreed with a particular aspect of our original annotation. In such cases we re-annotated the example, but kept the original annotation on the data spread sheet, in order to provide a record of the annotation history. This affected less than 10% of our examples of questions. When the re-annotation would have an effect on the semantic/pragmatic coding (i.e. when it affected the nuclear tune), we very carefully reviewed both annotations to make sure that the re-annotation was well founded phonetically. After the start of semantic/pragmatic coding, we made no further changes to the prosodic annotation.

3. The distribution and meaning of yes-no question contours in American English

As discussed in Section 1.1, it is widely acknowledged that yes-no questions in American English tend to end in a rising contour, but there is controversy over which kind of rising contour is typical: a low-rise or a high-rise. There has also been discussion of yes-no questions ending in a fall. We found examples of all of these contours in our corpus, as well as a few additional contours such as fall-rise and level. In this section, we first present the overall distribution of nuclear contours in our data. We then discuss each type of contour in turn, attempting to ascertain the meaning of each intonational type of question through an examination of the contexts of our tokens. We also discuss and evaluate how well specific claims and predictions from previous literature on intonational meaning account for each type of question contour.

Our initial classification of the nuclear contour of each yes-no question in our data is shown in Table 1.[11]

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with !H*."

[11] We follow Ladd (2008: 91) in mapping Pierrehumbert and ToBI contours onto British school nuclear contour labels.

Table 1:   Distribution of nuclear contours: Initial classification

Nuclear contour	Percentage	ToBI category	Total N
Low-rise	79.8%	L*H-H%	323
		L*H-↑H%	2
		L*L-H%	2
High-rise	10.7%	H*H-H%	39
		!H*H-H%	5
High-fall	2.4%	H*L-L%	9
		!H*L-L%	1
Rise-fall	1.7%	L+H*L-L%	7
Low-fall	1.5%	L*L-L%	6
Fall-rise	0.5%	H*L-H%	1
		L+H*L-H%	1
Level	3.4%	H*H-L%	8
		!H*H-L%	3
		¡H*H-L%	1
		L*+HH-L%	2
Total	**100%**		**410**

The vast majority of questions ended in some type of low-rise (327/410 or 79.8%), thus demonstrating that Pierrehumbert and Hirschberg (1990) were correct in stating that L*H-H% is the primary yes-no question contour in American English. The high-rise, however, was the second most common category of contour, and this occurred 10.7% (44/410) of the time. In Section 4.2 below, we will propose that some of the H* pitch accents that we initially classified as nuclear accents are in fact "post-nuclear accents" in the sense of Ladd (2008: 143 et seq.). This is because we observed in doing the semantic/pragmatic analysis that such H* pitch accents often occur in cases where a word that would normally remain unaccented for lexical or information structure reasons is in fact arguably accented.

Falling contours constitute 23/410 of the questions in our data, or 5.6%. Falling questions can be divided into high-fall (H*L-L%), rise-fall (L+H*L-L%), and low-fall (L*L-L%). We discuss falling questions in Section 3.3 below, confirming the conclusion of Banuazizi and Creswell (1999) that the falling contour marks 'non-genuine' questions in American English, e.g. questions used to make requests for action instead of requests for information.

Finally, fall-rise questions constitute 2/410 or 0.5% and level questions constitute 14/410 or 3.4% of the questions in our data. We argue in Section 3.4 below that fall-rise and level questions pattern with falling questions pragmatically.

In the next four subsections (Section 3.1-3.4) we examine each of these classes of final tunes, discussing how we identified them and what the meaning of these tunes seems to be in our data and in the literature. We introduce what we initially classified as high-rise nuclear contours in Section 3.2, but reserve complete discussion of them until Section 4.2 since in order to adequately characterize their nature and function, we must first consider the function of unaccented words that follow the nuclear accent in a question. That is, we must explicate post-nuclear "tails". We do this in Section 4.1. We introduce some previous literature on the meaning of the various final patterns in each subsection as it becomes relevant.

3.1.   *Low-rises (L*H-H%)*

3.1.1   *Classification of low-rise.* The most frequent final contour in our data is the low-rise, which occurred 79.8% of the time, for a total of 327/410 occurrences. The nuclear accent is low in the speaker's range and the pitch immediately rises until the end of the utterance. It is frequently the case that the prenuclear "head" material is falling in pitch, with the corresponding annotation in the ToBI system of an initial H* pitch accent followed by a series of downstepped !H* accent, depending on the number of accented syllables. Typical examples are shown in (2)-(5), where the number of accented syllables respectively increases from one to four. A pitch track, illustrating the contour of (4) is shown in Figure 1.

(2)   *Did you have a good **time?***
                            L*H-H%

(3)   *Is **that** what she **said?***
            H*   L*H-H%

(4)   *Do **you** still **work** for a **veterinarian?***
                H*   !H*   L*H-H%

(5)   *Do **you** want **me** to make a **reservation** at The **Quality?***
                H*   !H*   !H*   L*H-H%
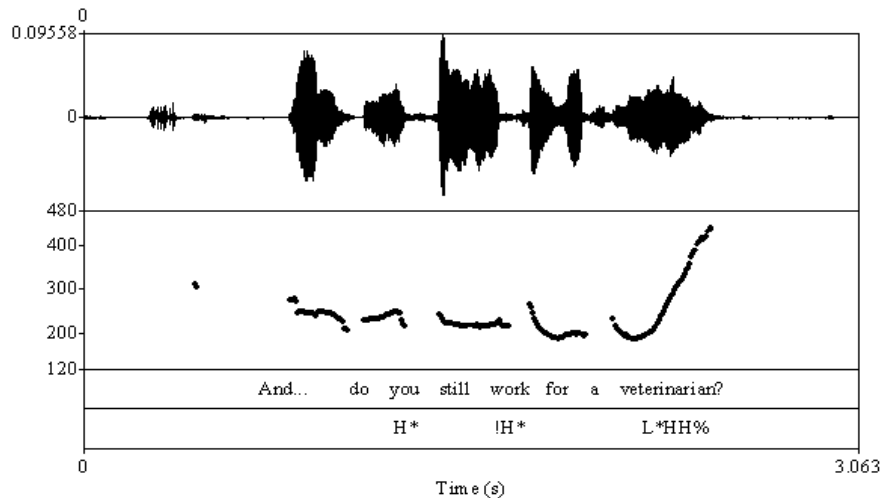
Figure 1:   A low-rise contour

3.1.2. *Meaning of low-rise.* A variety of approaches to the meaning of the low-rise contour were presented in Section 1.2. Thus, for Gussenhoven (1983), this contour signals 'Testing', so that "the speaker invites the listener to resolve the issue" of whether or not "the message is to be understood as belonging to the background." Compositional approaches characterize the meaning of the different parts of the ToBI contour separately. For Pierrehumbert and Hirschberg (1990), this contour specifies that the speaker does not want to predicate the item marked by the pitch accent as new information in the context as well as the idea that the information expressed in the intermediate phrase and intonation phrase should be interpreted with respect to the answer

that follows. For Bartels (1999), the parts of the contour mark an entity as being already evoked and salient as well as the lack of assertion of the proposition and continuation dependence. Finally for Steedman (2000, 2007), the contour indicates a contentious rheme that the hearer is committed to. We suggest that all of these characterizations of the meaning of the low-rise question contour are quite convincing, except perhaps for Bartels' analysis of the L* pitch accent, which we found to occur on elements that are not already contextually evoked, the L* pitch accents occurring in (2)-(5) above.

O'Connor and Arnold (1973) characterize the meaning of the combination of prenuclear material and low-rise nucleus in British English. Thus, they assign the label "Low Bounce" to a low-rise preceded by a high head and an optional low prehead, or to a low-rise preceded solely by a high prehead. They say, "This is by far the most common way of asking yes-no questions; it should be regarded as the normal way, with the speaker displaying *genuine interest* in obtaining the information requested." Hedberg et al. (2006), however, reports that the most typical yes-no question in their data on American English (a subset of our data) is a low-rise preceded by a falling head rather than a high head. O'Connor and Arnold assign the label "Take Off" to a variant consisting of a low-rise preceded by optional low head and optional low prehead, and they characterize its meaning as follows: "Such questions almost invariably express disapproval or skepticism."

3.1.3. *Variation within the low-rise class.* In two examples we find increased range associated with the boundary tone, as shown in (6) and (7). The pitch goes into falsetto and the impression is that the meaning is one of incredulity or exclamation.

(6)   *Is that **crazy?***
                L*H-↑H%

(7)   *Eh does your **insurance** cover it?*
                L*H-↑H%

There were also two examples that exhibited what we analyzed as a low low-rise contour (L*L-H%) because the onset of the rise following the final low pitch accent was delayed. These are shown in (8) and (9):

(8)   *Do you **have** a **tan?***
                H*   L*L-H%

(9)   *{gasp} Oh do you have to **go?***
                L*L-H%

While Bartels (1999) proposes 'assertion' status to such utterances because of the low phrase accent, we still find that these questions have full question meaning. The extended low contributes a nuance of teasing or complaint. We also do not find a 'contradiction contour' meaning for these questions, although L*L-H% is the nuclear contour often associated with contradictions (Liberman and Sag 1974, Pierrehumbert and Hirschberg 1990).

3.2.   *High-rises (H*H-H%)*
3.2.1.   *Classification of high-rises.* After the low-rise, the next most frequent final contour is the high-rise, which occurred 44 times, or in 10.7% of our data. Gussenhoven (2004) uses the notation H*Hi and characterizes it as follows: "It has a target at mid pitch in the accented syllable, followed by a rise due to Hi, which is upstepped after H, as in Pierrehumbert (1980)." Some examples are shown in (10)-(11). Sample pitch tracks are shown in Figures 6 and 8 below.

(10)   *Do **I** sound **staticky** to **you**?*
            L*   H*   H*H-H%

(11)   *Is **anybody coming** before **that**?*
            L*   L*   H*H-H%

The relatively low percentage of high-rise nuclei in our data suggests that Cruttenden (1986, 1997) and Bolinger (1998) are wrong about high-rise occurring frequently in American English.

3.2.2.   *The meaning of high-rises.* Gussenhoven (2004: 299) says that he finds it "hard to discern any meaning difference between the high-rise and the low-rise." However, in the British School literature, the meaning of 'casual' has been associated with questions pronounced with this contour. Thus, O'Connor and Arnold (1973) assign the label "High Bounce" to contours in British English ending in a high-rise nucleus preceded by an optional low prehead and an optional high head. They suggest that yes-no questions with the High Bounce may be echoed, but that "straightforward questions may…be asked with this tone group, when they sound *lighter*, *more casual* than with the Take Off or the Low Bounce." Cruttenden (1986) reiterates this characterization: high-rise tones sound more 'casual' than low-rise tones. Furthermore, since he claims that high-rising tones are "much more frequent in American English than in British English", he claims that this is why Americans sound casual to the British while the British sound formal to Americans. (p. 59). Bolinger 1998 also suggests that high-rises in yes-no questions are found more frequently in American English than British English and that's why Americans sound 'businesslike' to the British ear whereas the British sound 'unduly concerned' (with cordiality in the example he gives, which involves offering tea) to the American ear. Cruttenden and Bolinger thus seem to agree that the low-rise in British English—when Americans would use the high-rise—sounds formal to Americans (i.e. more cordial—less casual, less businesslike).
        As mentioned above, we did not find support for the hypothesis that high-rises occur more often in American English than British English in that we found that the vast majority of American English questions are in fact produced with a low-rise.[12] With respect to the meaning of the high-rise nuclear tune when it does occur in yes-no questions, we do not find the casualness explanation to be persuasive. Instead, we suggest that the distinctive meaning of this contour lies in information structure. As first suggested in Hedberg et al. (2008), we claim that the high-rise marks information that lacks lexical semantic content and/or is given in the discourse, i.e. material that would typically be left unaccented, but is accented, for some reason,

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[12] Of course, it is possible that high-rises occur even less frequently in British English. A comparative study would be needed to establish this. Also it could be that high-rises in British English really are used for the purpose of signaling "casual" or "businesslike". This is consistent with high-rises being used in American English for an information structure purpose like we claim here, while nonetheless sounding casual to British speakers.

in these particular contexts. In (10) for example, the proposition "you sound staticky to me" is evoked by the speaker's statement "it's really staticky", so that the final pronoun in the immediately following question, "do I sound staticky to you?," is contrastive. This contrastiveness apparently justifies a pitch accent on the pronoun 'you', which thus becomes the nuclear accent. In (11), the accent appears to signal that the referent is activated but not in the focus of attention and thus needs to be accented in order to signal focus shift (Gundel, Hedberg and Zacharski 1993). Evidence for this claim about the meaning of the high-rise nuclear contour will be detailed in Section 4.2 after we have discussed the function of "tails". In that section we address the issue of whether such H* accents are nuclear or post-nuclear.[13]

3.3. *Falls (X*L-L%[14])*

3.3.1 *Classification of falls*. We found that falls (high-falls, low-falls, rise-falls, and downstepped high-falls) occurred 23/410 times in our data (5.6%). An example of each of the first three is shown in (12)-(14). The pitch track of (12) is shown in Figure 2. It can be seen that the pitch contour falls to the bottom of the speaker's range after the high nuclear pitch accent on the final word.

(12)　　*Is it is it **treatable**?*
　　　　　　　　H*L-L%

(13)　　*is **that** right?*
　　　　　　L*L-L%

(14)　　*Is there a **lawyer** in the house?*
　　　　　　　　L+H*L-L%
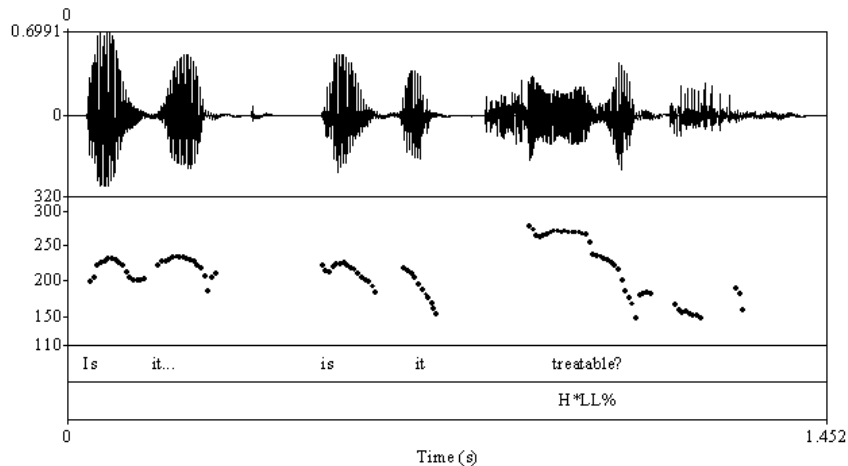
Figure 2:　　A high-fall contour

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[13] There were five examples in which the final pitch accent was intermediate in height, followed by a rise. We annotated these as high-rises containing a down-stepped pitch accent: !H*H-H%. We did not find any difference in function between high-rises and downstepped high-rises. An example is shown in (i):
(i)　　　*Did **she enjoy**　　　coming **visiting here***
　　　　　　H*　L*H-H%　　H*　　　L*+H !H*H-H%
[14] We use the symbol 'X' here as a variable to indicate that any pitch accent can occur in this tune.

3.3.2. *Meaning of fall.* The occurrence of falling final intonational contours in yes-no questions has received a fair amount of discussion in the previous literature. The most complete discussion occurs in Banuazizi and Creswell (1999), who investigated 217 falling yes-no questions out of 3,789 questions from the Switchboard corpus of American English, as annotated by Jurafsky et al. (1997). This corpus consists of telephone conversations on assigned topics between people who do not know each other. They argue that a falling syntactic yes-no question is intended to be interpreted as a "non-genuine" question, rather than a "genuine" one. Following Hudson (1975) and Kenworthy (1978), they argue that for a question to be interpreted as genuine, it must conform to the sincerity conditions that the speaker does not already know the answer to the question, that the speaker desires a response from the hearer, and that the speaker expects that the hearer can provide a response. If one of these conditions is violated, the question is considered a non-genuine question. They conclude that the questions that they classified as ending with a final fall are non-genuine.

   In our study, we have also found that the vast majority of questions that end in a fall rather than a rise fit the categories defined in Banuazizi and Creswell (1999). Our percentage of falling contours is quite similar to theirs, since they found 5.7% falling questions and we found 5.6%. Table 2 shows the distribution of our questions according to Banuazizi and Creswell's categories of non-genuine question.[15] Like Banuazizi and Cresswell, we also analyzed a sample of rising questions to determine the percentage of times that such questions can be characterized as non-genuine. We took a random sample of 96 low-rise questions and determined that only 12 of these questions (12.5%) fit into the categories of non-genuine questions. The distribution of 1/23 genuine falling questions vs. 84/96 genuine low-rise questions is statistically significant (Fisher's exact test, two-tailed, $p < .0001$[16]). Table 2 also shows the distribution of the low-rise questions into Banuazizi and Cresswell's categories.

Table 2:   Pragmatic categories of yes-no questions that fall and rise

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	-

[15] The third-author initially classified all of the questions as genuine or non-genuine, and classified the non-genuine questions into subtypes. The first author reviewed these classifications. Any discrepancies were resolved through discussion.

[16] The Fisher's exact test was performed on a two-by-two table created by collapsing all non-genuine question cells.

Information couched in question form.	2	1
Questions to self.	0	-
Genuine question.	1	84
Total	**23**	**96**

One category of falling nuclei is requests for action couched in question form (two times). In (15), the speaker politely requests the addressee to start talking about jobs and not school issues. In (16), the speaker requests the addressee to tell about the death of his father to other people. In both cases, the speaker does not desire a response to the question.

(15)   *Can we **talk** about the **job** things now?*
                H*   L*L-L%

(16)   *Yeah, **would** you please **tell** them?*
                L*+H   L*L-L%

We also found one instance of a pre-request (Levinson 1983) couched in question form, as shown in (17). The speaker wants to know whether the addressee has a picture of her and her friend, so that if the answer is yes, she will request that the addressee's mother send her that picture. It seems that a natural extension of using falling intonation for requests is to use falling intonation on pre-requests.

(17)   *Do **you** have a **piccy** of **me** and **Jessie**?*
                L+H*   H*   !H*   L*L-L%

Examples (18) and (19) display announcements of information couched in question form. In (18), the speaker informs the addressee that he has a new job by uttering the question. In (19), the speaker wants to inform the addressee about someone who had a bypass operation. The final contour on the word 'bypass' has a rise on the first syllable, followed by a fall on the main stress.[17]

(18)   *Did **I**   **tell** you that **I** have a new **job**?*
                L+H* !H*   !H*   L*L-L%

(19)   *Didja **know** that he just **had** a **by**   **pass**?*
                H*   !H*   L+H* H*L-L%

The most frequently occurring pattern is that in which a particular response is clearly expected (eight times). In (20), the assigned topic for the speakers is disarming Iraq. From the preceding and following context it is evident that both the speaker and the addressee think that Al Qaeda has nothing to do with the Iraqis. Therefore, the speaker utters this question expecting a negative answer, which, in fact, is the response. (21) is an instance in which the speaker realizes that the addressee sounds hoarse and coughs while talking. Then she utters the question in (21) clearly expecting a positive answer.

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[17] In very emphatic speech like this, we sometimes posit two pitch accents on a single word.

(20)   *Do you **think that**   **that**   **Al Qaeda**   **has** a whole **lot** to **do** with the **Iraqis?***
                H*   H*LL% H*L-L% L* L*+H   !H*   !H* !H*   !H*L-L%

(21)   *Do you have a **cold***?
                      H*L-L%

Quoted or reported questions with a fall were found two times, as illustrated in (22). This occurs in those cases in which the speaker quotes or paraphrases questions that he himself or other people uttered on a different occasion. The speaker does not expect the hearer to give an answer. In (22), it has been discussed that the addressee is going to Japan but he knows that it will be very hot there. The addressee is not sure whether he will be provided with an apartment with an air conditioner. The speaker suggests that he ask whether he will get one by uttering the question in (22).

(22)   *Is there an **air** conditioner in my **apartment***?
                L*   L+H*L-L%

We also found two questions functioning as discourse markers, as illustrated in (23). Such 'backchannel responses' simply display acceptance to the addressee's contribution and do not require an answer, although the hearer may provide one. In (23) the speaker has been informed that some people got stuck at the airport due to a snowstorm and utters this question without waiting for a real response.

(23)   **Did** *they?*
     H*L-L%

Two falls occur on questions with which a new topic within the conversation is introduced. In (24) the speaker and the hearer who do not know each other are talking about the assigned topic of U.S. policy in Iraq and the speaker announces a new subtopic within the conversation.

(24)   *Do you **worry** about **retaliation***?
                H*   L*+H L+H*L-L%

In (25), on the other hand, the speaker explicitly expects a response from the hearer. The speaker knows that the hearer has been to Japan recently and wants to know whether he had been there before. This question appears to be genuine.

(25)   *Had you **been there before***?
                H*   H*   L+H*L-L%

To conclude, 22 out of 23 falling questions in our data fit the categories proposed by Banuazizi and Creswell for non-genuine questions, a finding that strongly supports their hypothesis that the falling contour indicates a non-genuine question.[18]

3.3.3. *Related theoretical and empirical studies of falling yes-no questions*. There have been related descriptions of the meanings associated with falling positive yes-no questions. We report on three of them here and then describe three corpus studies that investigated falling yes-no questions and one experimental study.

First, O'Connor and Arnold (1973) describe the effect on British English yes-no questions of three ''tone group'' patterns ending in a low-fall (the Low Drop) or a high-fall (the High Drop), both of which are preceded by high heads, and the Long Jump, which consists of a high-fall preceded by a rising head. In all three cases, they conclude that the questions are put forward as "subjects for discussion and decision rather than for an immediate answer." They suggest that the Low Drop "sounds more serious, whereas the High Drop sounds lighter and less urgent", and with the Long Jump, the speaker is suggesting that the question is "crucial". This account of falling questions is compatible with Banuazizi and Cresswell (1999)'s characterization of falling questions as non-genuine since the claim is that they are not seeking an immediate answer.

Second, Bartels (1999) classifies three types of falling interrogative positive yes-no sentences as 'non-question interrogatives'. She analyzes each of them as containing an ASSERT operator associated with the L- phrase accent. These include "inferentially assertive interrogatives" as in (26), "interrogative exclamations" as in (27), and "interrogative directives" as in (28). Her claim is that each of these can be pronounced with falling intonation.[19] This group of questions would clearly be classified by Banuazizi and Cresswell (1999) as non-genuine questions.

(26)   A: *John will be late. He just called to say he's run out of gas south of Springfield.*
        B: *(So) does John have a **car** (then). I didn't know.*
                            H*L-L%

(27)   *Have **they grown**!*
            H*   H*L-L%

(28)   *Can you pass me the **salt**, please? (= Pass me the salt.)*
                        H*L-L%[20]

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[18]Although there is a difference in intonation pattern between high-falls (H*L-L%), downstepped high-falls (!H*L-L%), rise-falls (L+H*L-L%), and low-falls (L*L-L%), we found no semantic or pragmatic difference between such contours in that all of them are chosen by speakers to mark non-genuine questions.

[19] Bartels also proposes (p. 252) that negative rhetorical interrogatives can sometimes receive a falling contour:
(i)   *Isn't Mady's word good **enough**? (= Mady's word is good enough)*
            a.   H*/L* H-H%
            b .   H*/L*+H L-L%
Following Bolinger (1978), Bartels also posits a class of "*whether*-questions" as containing a falling contour. She claims that these are paraphrases of alternative questions and echo their prosody:
(ii)   a.   *Did you **buy** it or **didn't** you?*
                        H*H-   H+!H*L-L%
         b.   *Did you **buy** it?*
                        H* L-L%
[20] Bartels states that other contours can also occur on this question when it has a request meaning.

Finally, Steedman (2000, 2007) would predict that falling questions, which have a low phrase accent and a low boundary tone (L-L%) should indicate commitment by the speaker for the propositional content rather than commitment by the hearer, as would be the case with rising questions (L*H-H% and H*H-H%). This characterization fits many of our non-genuine questions, e.g. announcements of information.

There have been three additional corpus studies that report finding falling yes-no questions. First, Fries (1964) studied questions recorded from an American television show where panelists attempted to guess contestants' professions by asking questions, a format which supports the strategy of asking a question only when the questioner is fairly sure of the answer. Fries found that 61.7% of the 2,561 questions in his corpus were falling rather than rising. Banuazizi and Cresswell (1999) discuss this article by Fries and identify such questions as non-genuine questions, fitting into the category, 'a particular response is clearly expected.'

Second, Hirschberg (1995) reports on a corpus study that indicated that 43.3% of yes-no questions in spontaneous speech were falling instead or rising. However, in this study, speakers believed that they were questioning a computer with regard to arranging travel plans. It seems to us that speakers were aware that they were querying a computerized data-base and so didn't believe that the addressee could provide an equally likely 'yes' or 'no' answer. Perhaps their questions were not genuine queries, but rather were demands to the system to answer.

Third, Hedberg and Sosa (2002) report on a corpus study that also shows that yes-no questions tend to fall instead of rise. They found that 16/29 (55.2%) questions in their corpus were falling in intonation. However, this was a corpus taken from the half-hour PBS program, "The McLaughlin Group " (four episodes) and "Washington Week in Review" (one episode). Most questions came from the moderator, John McLaughlin, and took the form of announcements of questions for the panelists to answer, such as that shown in (29). Banuazizi and Cresswell (1999) would classify these as topic or subtopic initiators.

(29)   *Yes or no answer. Will **Michael Bloomberg** be **able** to **fill Giuliani's shoes**? Yes or no.*
                        H*+L   H*+!H*   H*   H*   H*+L   H*L-L%

Finally, we are aware of one experimental study on genuine vs. non-genuine questions. Chu-Carroll and Nickerson (2000) report on a production experiment that was intended to determine whether direct and indirect speech acts encoded in yes-no questions are distinguished acoustically. They constructed dialogues that triggered direct or indirect speech acts in three categories: questions with 'can' that concern the hearer's ability to perform an action ("Can you move the couch?"), questions with 'would' that concern the hearer's performing an action ("Would you take him to dinner?") and questions with 'would willing', which concern the hearer's willingness to perform an action ("Would you be willing to work for me?"). The direct speech act dialogues were designed to elicit questions that were genuine in our terms, i.e. where a 'yes' or 'no' answer was intended, and the indirect speech act dialogues were designed to elicit questions that were non-genuine, i.e. a request for action. They found that 73% of the 26 utterances with low boundary tones (L%) occurred in the indirect dialogues, whereas only 46% of the 170 utterances with high boundary tones (L*H-H%) occurred in the indirect dialogues. This experimental finding supports our corpus study finding that falling as opposed to rising yes-no questions tend to be non-genuine.

3.4.   *Levels and fall-rises (X*H-L% and (L+)H*L-H%)*

3.4.1. *Classification and meaning of levels*. Questions ending in a final level contour are particularly interesting to examine. Ladd (1978) proposes that the "vocative chant" or "calling contour" should be analyzed as a "stylized" variant of a nuclear fall. This contour consists of a stepping down pattern between two level tones. Gussenhoven (2004) characterizes the "vocative chant" as H*!H-L% in ToBI (p. 142). Ladd suggests that "stylization" should be considered a distinctive feature added to the features of a contour tone, and he supports this analysis with the claim that nuclear contours other than falls also have stylized variants, which again are realized with level contours. Thus, he suggests that there are stylized low-rises and high-rises in English, Ladd (1996:82) characterizes L*H-L% and L*+HH-L% as 'stylized low-rises' and H*H-L% as 'stylized high-rise.' In our data we also find !H*H-L%, which could be called a 'stylized downstepped high-rise.' The H-L% edge tone sequence in ToBI is used to indicate a level final contour: a high (H-) target is pulled lower by a low (L%) boundary tone.

According to Ladd (1978), in all cases, stylization adds a semantic meaning of "a certain amount of predictability or stereotype in the message" (p. 520). Thus parents routinely call their children in for dinner with the calling contour shown in (30), but it wouldn't be used to call out that there is a fire.

(30)   *Joh*
                nnie--

Ladd (1978) detects the same nuance of meaning in the stylized low-rise question in (31), which he characterizes as "used in the middle of a dialog to confirm crucial background information", interrupting a conversation about a mutual acquaintance, and implying that "I realize this is very relevant to what we're talking about, and I should know, but all of a sudden I'm not sure; could you please confirm?" (p. 528):

(31)   *she*
                Jewish--
         Is

We found that three out of our fourteen level questions had the "confirmation question" quality that Ladd detects in (31). In (32) the addressee mentions that the aunt of his partner had passed away. The speaker wants to know if the aunt died before or after she and the addressee had last talked.

(32)   *That, that hadn't happ-, **had** that **happened** already?*
                                L*   H*H-L%

A pitch track of this example is shown in Figure 3. Note the length of the level contour after the nuclear accent on 'happened'.[21]

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[21] An H*H-L% tonal sequence can either be realized as a completely flat nuclear contour, as in Figure 3, or can be realized as a high accented syllable followed by a step down to a level edge tone sequence, as in (30) and (31). (Veilleux et al. 2006).
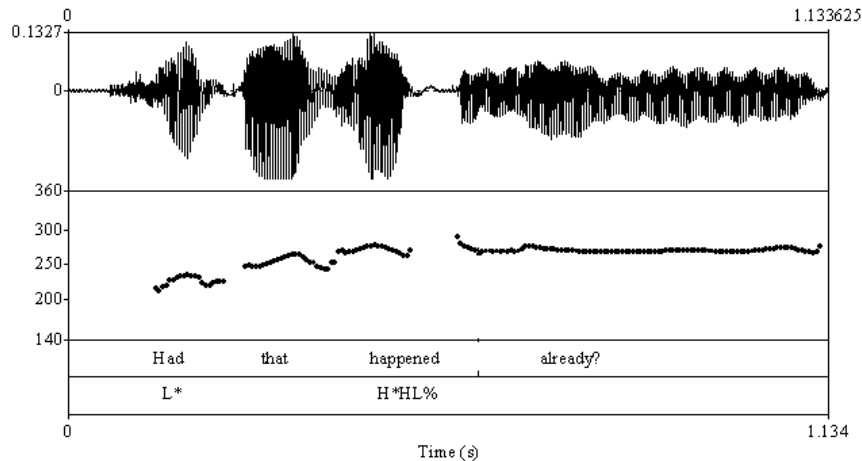
Figure 3:   A high-level contour

In (33), similarly, the addressee had just said that the speaker had told him already. The speaker is confirming that he had already told him.

(33)   *Did I **tell** you **that**?*
          H*   H*HL%

Ladd characterizes his example in (34), as contributing an "overtone of tiredness or resignation" (p. 529):

(34)   *go now--*
   Can I

One of our examples, shown in (35), is similar to this. The speaker is complaining about having to go to a formal wedding.

(35)   *Do I **have** to wear a **tie?***
         H*   H*H-L%

Bartels (1999: 151-153) proposes that the L% boundary tone compositionally conveys lack of the meaning contributed by an H% boundary. In her view, H% conveys "continuation dependence", which in ordinary yes-no questions indicates that an answer from the addressee is expected. Her example of a level yes-no question lacking this boundary tone is shown in (36):

(36)   S: *(Overworked official) This form here says you're applying for jobs LB18 and LB27. I suppose you know the requirements.*
       *Do you speak **Portuguese?***
              H*H-L%

For Bartels, an H- phrase accent contributes "speaker uncertainty" and that the speaker is "uttering the sentence because she has reason to think that her addressee is both willing and able to alleviate her uncertainty. The H% tone [which typically follows] provides a means to emphasize this expectation." Without the H%, "the question is merely 'posed', rather than

directed at a (real or hypothetical) addressee." (p. 152). Thus, it is still a question but nonetheless an answer is not entirely expected—i.e. it lacks "other directedness". She proposes that Ladd's "stylized" question meaning follows from this characterization of H-L%.

Questions such as this one that lack the expectation of an answer would be classified as non-genuine questions by Banuazizi and Creswell (1999). Most of our examples of questions ending in a level contour fall into categories of non-genuine questions already established for questions ending in falling contours. In (37) and in one other case, the question seems to be "merely posed" rather than actually asked in expectation of a response.

(37)   *Does she still **look** like a **Teutonic** uh **pin**-up?*
                    H*L-   H*L-   H*H-L%

Three other examples could be construed as announcements of information, as in (38) and (39):

(38)   *Did you **hear** about **Martha** getting **married**?*
                    H*   L*+H   H*H-L%

(39)   *But uh **did Stephanie** tell you **about** my **crystal bingo**?*
                    H*   H*   L*   H*L-   H*H-L%

In three other cases, exemplified in (40) and (41), the speaker is opening up a new topic or subtopic and announces the new topic by means of the question.

(40)   *Would you **ever bungee** jump?*
                    H*   H*H-L%

(41)   *Would you **ever do** a reality t.v. show?*
                    H* L*+HH-L%

Finally, two other examples function as discourse markers, as in (42):

(42)   *Oh **did** she?*
            L*H-L%

In sum, we suggest that the meaning of a level nuclear contour on yes-no questions is either to mark a question as stylized in the sense of Ladd (1978) or else to mark the question as non-genuine. Thus, level questions tend to function as falling questions that do not reach to the bottom of the speaker's range.

3.4.2. *Classification and meaning of fall-rises*. There were two examples of a fall-rise or rise-fall-rise nuclear contour in our data, one of which is shown in (43).

(43)   *Well do you **think** this is **pajamas?***
                    H*   H*L-H%

Here, the addressee had sent a picture to the speaker's daughter, who thought that everybody in the picture was wearing pajamas. The speaker reports that she asked her daughter the question in (52), explaining that the costumes are not pajamas. The pitchtrack is shown in Figure 4. This question is non-genuine and fits into Banuazizi and Cresswell (1999)'s category of quoted or reported questions.
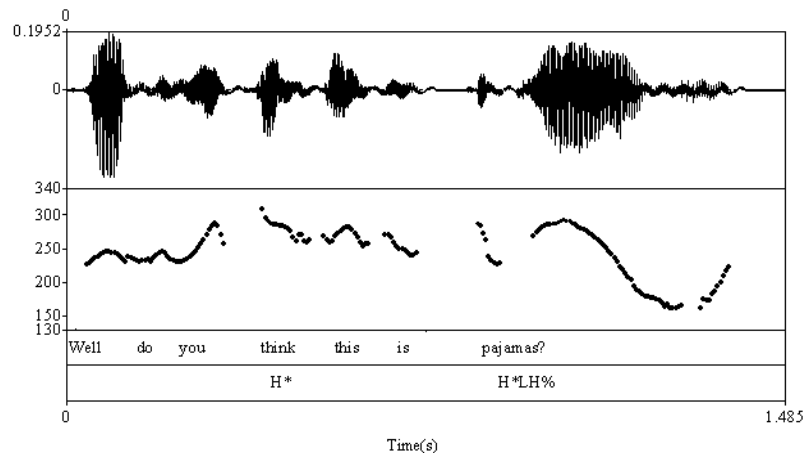

Figure 4:   A fall-rise contour

The speaker of (52) is reporting a question that originally expressed incredulity and echoed the daughter's statement that the people in the picture were wearing pajamas. Fall-rise questions have occasionally been associated with astonishment and echo questions in the literature. Thus, O'Connor and Arnold (1973) assign the label "Switchback" to a Fall-Rise Nucleus preceded by a falling head. They suggest that this tone group indicates astonishment in echoed yes-no questions, and state that this tone group can be used to make corrections to questions as well as statements. Ladd (1986:122) also associates the fall-rise nuclear contour with echo questions, but to echo questions in declarative syntactic form that convey "a strong measure of doubt or disbelief." He states that this contour is used in British English in polite transaction-opening questions, and that when British speakers use this contour in North America, it sounds condescending or peremptory due to its use in echo questions by Americans. On the other hand, Bartels (1999: 153-159) suggests that fall-rise yes-no questions can be grouped together with interrogative assertions. This again would be compatible with a Banuazizi-and-Creswell-style characterization of them as non-genuine questions.

In sum, although we don't have very many examples, level and fall-rise yes-no questions in our data seem to pattern with falling yes-no questions in expressing non-genuine questions.

4.   Tails and high-rises

4.1.   *Tails*

O'Connor and Arnold (1973) use the term "tail" for unaccented syllables after the nucleus within an intonation phrase. For convenience, we follow this usage although we do not adopt O'Connor and Arnold's notion of the constituency of intonation phrases. Before turning to a description of the tails that we found in our data, we review the history of the notion of tail within the literature on the prosody of English.

Halliday (1967) was perhaps the first researcher to posit that words following the focus are given in the discourse and therefore unaccented. Related ideas have been widely recognized in the later generative literature on focus and focus projection (e.g. Selkirk 1984, 1995, Rochemont 1986), including most recently Optimality Theoretic accounts.[22] We classified all the tails in our data semantically and pragmatically, finding that they fall into the categories detailed in Table 3.[23] Examples of each of these are shown below. Rising tails characteristic of questions are not often mentioned in the literature, but Ladd (1996: 209) cites Palmer (1922), the founder of the British School of intonation analysis, as maintaining that "the shape of the tail is largely or entirely dictated by the choice of nuclear tone". The table should be read from top to bottom in order to understand how the rows represent mutually exclusive categories.[24]

Table 3: Lexical/pragmatic distribution of tails

Tails	Number	Percentage
Function words: adverbs, prepositions, copula (discourse new)	43	25.3%
Personal and demonstrative pronouns (discourse old)	55	32.5%
Semantically light words (discourse new)	15	8.8%
Discourse-new words following normal early stress	20	11.8%
Other discourse-old words or phrases included in discourse old open propositions	13	7.6%
Other discourse-old words or phrases	20	11.8%
Other discourse-new but hearer-old words or phrases	4	2.4%
Total	**170**	**100.2%**

As the table shows, the types of words that occur as components of tails in questions are the same types of words that have been reported in the literature to occur as tails in statements. A clear summary of the factors that go into determining accentability in statements (and its converse, ability to be unaccented) is presented in Zacharski et al. (1995) and Ladd (1996). Part of speech (i.e. function words), 'semantic weight' (e.g. 'empty' content words like *thing* or *stuff*), and givenness are relevant factors.

Forty three examples of tails constitute function words, including some adverbs and propositions, as well as the copula, as in (44)-(46).

(44)   ***Does*** it ***move around*** *yet?*
         L*+H   H*   L*H-H%

---

[22] Lack of accent after a focused constituent is derived in some recent Optimality Theoretic accounts by ranking a constraint called Focus higher than a rightwards alignment constraint (Truckenbrodt 1995, Féry and Samek-Lodovici 2006, inter alia).

[23] The initial coding here was done by the first author. The coding was checked by the third author and any discrepancies were resolved by discussion.

[24] See Prince (1992) for the discourse-old/new, hearer-old/new distinctions.

(45)   *Is she in **Spain** already?*
                 L*H-H%

(46)   ***Did** you **drive** there?*
         H*   L*H-H%

Fifty-five examples occurred with a post-nuclear anaphoric or deictic pronoun, such as those in (47)-(49). The unaccented material represents material that is characterized as 'discourse old' (Prince 1992), 'activated' (Gundel et al. 1993), or 'given' (Schwarzschild 1999).

(47)   *But does he **always** want to **do** it?*
                 L*+H H-   L*H-H%

(48)   *Did you **speak** to her?*
                 L*H-H%

(49)   *Have you **seen** that?*
                 L*H-H%

Fifteen examples occurred with other semantically light words, as in (50) and (51).

(50)   *Do you **stay** at like **hostels** and stuff?*
         H*   L*H-H%

(51)   *Are you **losing** anything?*
                 L*H-H%

Examples (52) and (53) illustrate the occurrence of normal focal stress on a pre-final word. This pattern occurred 20 times. (52) is an example of compound stress (Chomsky and Halle 1968), and (53) is an example of an intransitive verb that normally takes stress on its subject when the clause presents 'all new' information (Schmerling 1976).

(52)   *Have you **seen** any **koala** bears?*
                 H*   L*H-H%

(53)   *Oh **did** your **sister** die?*
         L*   ¡H*H-L%

Example (54) shows an activated open proposition (Prince 1986) occurring partly in a tail. It had just been mentioned that a certain person would probably not be able to come. The question asks contrastively if *they* are going to still come, with the 'X is/is not going to still come' information activated, and therefore realized by means of a long, unaccented tail in the question, and a narrow focus nuclear accent on *they*.

(54)   A: *So th- anyway they just found something and they're going to start treating it like this*
           week so now they're not sure if he can come but mom thought it was so sweet that he
           wanted to come.
        B: *Yeah. But are **they** gonna still come?*
                        H*H-H%

Similarly, in (55) it has been asserted that the addressee has been to Holland before, hence the
open proposition (OP), "x has been here before", is activated. In (56), it has been asserted that
the addressee had been at the beach but not in the water with the baby, and the speaker is
concerned about the baby being left in the sun; hence the OP, "A did/didn't do something in
relation to the beach", is activated.

(55)   *Has **Kim** been here before?*
            L*H-H%

(56)   *But did you **go on** the beach?*
                L* L*H-H%

There were 13 instances of unaccented words and phrases occurring post-focally in activated
open propositions. Note that the tails associated with these open propositions were identified
phonologically as such before we examined the transcript to ascertain whether positing a tail was
justified pragmatically.
        Twenty additional examples of tails showed simple post-focus discourse-old phrases that
were unaccented. For example in (57), the new job had just been discussed and in (58)
Philadelphia has been discussed.

(57)   *Does she **have hospitalization** in his new job?*
                    H* H*   L*H-H%

(58)   ***Are** you planning on coming **back** to Philly?*
          H*   L*H-H%

In (59), one child of some elderly relatives had been discussed, and in (60) a letter of the
addressee had just been discussed. These examples show instances of contrastive stress
preceding activated information. (61) is also an example of contrastive stress. The speaker is
verifying that the free phone call that the speaker and addressee are participating in lasts for 30
minutes.

(59)   *And **did** they **mention** their **other** children?*
            H*   H*L-   L*H-H%

(60)   *Did you **ever get** any of **my** letters?*
                H* !H   L*H-H%

(61)   *Is it **thirty** minutes?*
          L*H-H%

       Discourse-new but hearer-old status (unactivated but familiar for Gundel et al. (1993)) occasionally seems to be sufficient to trigger prosodic treatment as a tail (four times), as shown in (62) and (63). In (62), it is mutually familiar, even inferable, that her name is or is not Arlene. That is, the speaker is implying that she should know the name but cannot remember. Thus, the answer will fulfill a reminder function.

(62)   *Um **Arlene**, was **that** her name?*
          L*H-H%   L*H-H%

Example (63) is similar in that the speaker implies that she should know whether they had ever met Rhea since people normally remember whether they have met someone. Again the speaker is asking for a reminder of mutually familiar but unactivated information. That both examples involve left dislocation perhaps indicates a characteristic feature of this type of question.

(63)   *Rose's sister Rhea, **did** we ever meet her?*
                  L*H-H%

It must be acknowledged, of course, that all questions presuppose that the addressee knows the answer to the question. The situation is different in (62) and (63). Here, the information in the tail is marked as also expected to be familiar to the speaker.
       We can conclude that the occurrence of tails in yes-no questions is highly predictable. It needs to be pointed out, however, that while recent Optimality Theoretic accounts of accenting mentioned in Section 4.1 take into account the lack of accent on discourse-old information of various sorts, they do not mention the lack of accent on function words and words following early normal stress. Earlier generative accounts (e.g. Chomsky and Halle 1968), on the other hand, assign nuclear stress to the last "stressable word", which excludes function words. Schmerling (1976), for example, discusses examples exhibiting early normal stress, e.g. on the subjects of certain intransitive verb phrases. Our first main point in this section is that lack of accent in questions follows the rules that have been proposed for lack of accent in statements, including the just-mentioned elaborations. Our second main point, which is original to this work, is that the same factors that lead to lack of accent in tails also seem to lead to a large number of the yes-no questions annotated as high-rise in our study as opposed to questions that we annotated as low-rise. We examine this correlation in the following section.

4.2.   *High-rises*
4.2.1. *The meaning of high-rise in the literature*. As mentioned in Section 3.2.2 above, Cruttenden (1986) and Bolinger (1998) associate the meanings of 'casualness' and 'businesslike' as opposed to 'cordial' to high-rise questions in American English, or at least, these authors claim, that is how they sound to British speakers. The high-rise (H*H-H%) shares a high phrase accent and a high boundary tone with the low-rise (L*H-H%). Thus, Pierrehumbert and Hirschberg (1990) would claim that the only difference in meaning lies with the pitch accent, which in the high-rise would mean that the speaker wants to predicate the item marked by the pitch accent as new information, while high phrase accent and boundary tone, as

in the low-rise, indicate that the intermediate phrase and the intonation phrase should be interpreted with respect to the answer that follows. For Steedman (2000, 2007), the H* pitch accent indicates a non-contentious rheme, compared to a contentious rheme that the L* in the low-rise indicates, while the rising phrase accent and boundary tone again indicate hearer commitment.

We found, however, in our initial classification of high-rise yes-no questions in our corpus, that none of these attempts to characterize the meaning of the high-rise as opposed to the low-rise in American English was accurate. Instead, we found that the function of words marked by high-rise in American English yes-no questions seemed to be similar to the function of words in such questions that occur in unaccented tails: i.e. the high pitch accent seemed to be used to mark given information or function words. Compare, for example, the (a) and (b) examples in (64)-(68), where the (a) examples contain final words that were annotated H* and the (b) examples contain final words that were annotated as unaccented.

(64) a. *Do you **know them**?*
                    L*   H*H-H%

      b. *So **have** you been **able** to get **close** to them?*
              H*   !H*   L*H-H%

(65) a. *Could there **be** a **reason** for **that**?*
                      L*   L*+H   H*H-H%

      b. *Can **you believe** that?*
              H*   L*H-H%

(66) a. *Is that **really** such an **awful   job**?*
                  L*+H   L*+H   H*H-H%

      b. *And **did** they **mention** their **other** children?*
              H*   H*L-   L*H-H%

(67) a. *Did **she enjoy   coming visiting here**?*
              H*   L*H-H% H*   L*+H   !H*H-H%

      b. *Did you **get** my **letter** yet?*
                  L+H* L*H-H%

(68) a. *Do y- would you like an **area code**?*
                              L*+H H*H-H

      b. *Did I **send** it to **you** on **computer** paper?*
              H*   !H*   L*H-!H%

Instead of concluding that high-rise contours are H*-marked nuclear contours that have the pragmatics of tails, however, we consider the idea that the pitch accents involved are actually

not nuclear, but are rather post-nuclear accents, with the nuclear accent occurring earlier in the sentence, most often as a canonical low pitch accent.

4.2.2. *High final pitch accents in yes-no questions as post-nuclear accents.* Recently, the possibility of distinguishing focal, nuclear accents from non-focal accented elements of an edge tone has been articulated. Specifically, it has been proposed that there exist post-nuclear accents, which are edge tones, i.e. 'phrase accents' in ToBI, that are associated with post-nuclear lexically stressed syllables. Thus, Grice et al. (2000) propose that in the Eastern European Question Tune, the high phrase accent of the rise-fall (H-L%) question contour can be associated with a lexically stressed syllable, thereby creating a post-nuclear accent. (For discussion see Ladd (2008), section 4.1.3). Further examples of post-nuclear accents have been identified in Western Germanic fall-rise (L-H%) questions (Grice et al. 2000, Lickley et al. 2005) and in Romance languages (Prieto et al. 2005, Welby 2006) In the remainder of this section, we provide evidence which suggests that some of the high pitch accents that we initially classified as the head of nuclear high-rise contours actually arise from the association of the rising question edge tone with a lexically stressed syllable. That is, these accents that we annotated as H* are actually post-nuclear accents.

In order to answer the question of whether the critical words annotated with H* are actually accented at all, we subjected a subset of our tokens to a deeper phonetic analysis. Because compound nouns are normally accented on the first noun, and because personal and demonstrative pronouns are often unaccented, we decided to phonetically compare words of these types that we had annotated as unaccented or low-rise accented with those that we had annotated as high-rise accented. The distribution of the investigated words is shown in Table 4.

Table 4: Distribution of analyzed final words

	No accent	High-rise	Low-rise
Compound	8	2	-
you	6	2	2
that	11	3	3
them	5	1	-

We discuss the results of this analysis in section 4.2.2.1. We argue that these words are indeed pitch accented, and we explore the possibility that these pitch accents are post-nuclear accents. As discussed in Ladd (2008), the criterion for deciding whether an accent is nuclear or post-nuclear has to do with their meaning: Nuclear pitch accents serve to mark one of possibly several types of focus.

Nuclear accents are associated with an information-structural meaning in that they mark a constituent as the information focus of the utterance. In statements, the information focus (or 'comment' or 'rheme') of the utterance is that part of the utterance that is new in relation to the question eliciting the statement as an answer. In questions, the information focus is not as easy to identify because questions are not used to answer questions. Nonetheless, the notion of information focus is relevant to questions, as can be seen, for example, in the definitions of topic and comment from Gundel (1988), which are shown in (69):

(69)　a.　*An entity, E, is the **topic** of a sentence, S, iff, in using S, the speaker intends to increase the addressee's knowledge about, request information about or otherwise get the addressee to act with respect to E.*

　　b.　*A predication, P, is the **comment** of a sentence, S, iff, in using S the speaker intends P to be assessed relative to the topic of S.*

As a final step, we consulted the transcripts of the conversations to determine if our question final accents that were annotated as H* have a meaning that can be deemed nuclear or post-nuclear.

4.2.2.1. *In-depth study of a subset of high-rise tokens.* The lack of nuclear status for accents that we annotated as H* is particularly evident in final nominal compounds. Since it is the first word of a compound that receives lexical stress, we would expect the second noun to be unaccented, as indeed we thought it was in (70).

(70)　*Did you **get** my **post** card?*
　　　　　　H*　　!H*H-H%

However, in (71), we annotated the second noun with a high pitch accent.

(71)　*Did **you** get her **post card?***
　　　　　L*　　　　L*　　H*H-H%

As can be seen in Figures 5 and 6, acoustic cues to the difference between the two tokens of 'card' include a small difference in relative duration: 'card' takes up 54.2% of the total length of the compound in (71) but only 51.6% in (70). In terms of pitch movement, the rising slope begins with 'card' in (71), whereas the rise begins with 'post' or even 'my' in (70). The perception of prominence is correlated with the beginning of the rise. Because the final noun in (71) is not focused in any way, we would classify any pitch accent that does occur there as post-nuclear.
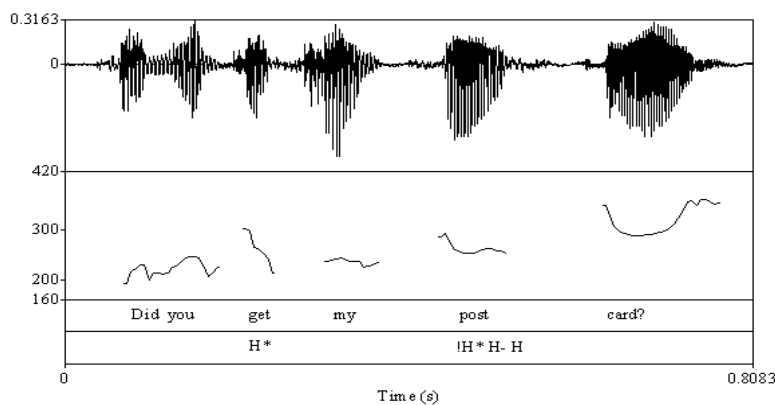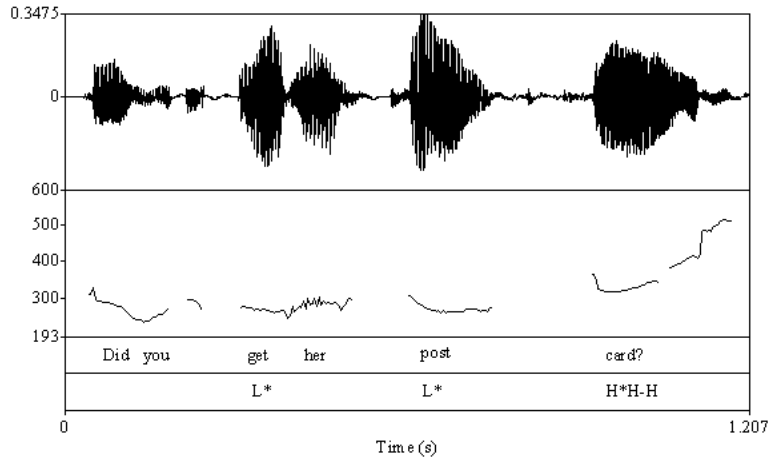

Figure 5:　　　Final unaccented 'card' (70*)*

Figure 6:   Final high-accented 'card' (71)

The final pitch accent in (73) is also a good candidate for a post-nuclear accent. In terms of information structure the pronoun seems identical to the unaccented final pronoun in (72). In both cases the proposition denoted by the pronoun has just been activated by the speaker, so no shift in attention is needed. Also, no contrast is being expressed.

(72)   *1096.37 1099.60 B: eh Lizzy Lizzy everybody feels that way who's worth his salt.*
        1097.98 1099.00 A: (( ))
        *1100.06 1100.83 B: Do you **know** that?*
                              L*H-H%

(73)   *289.03 290.07 A: Is he working now?*
        *290.63 292.55 B: No, in fact he got laid off. Did you **know that?***
                              H*   H*H-H%

The acoustic basis for the perception of prominence on the final pronoun in (73) compared to (72) again lies in the pattern of pitch movement, as can be seen by comparing Figures 7 and 8. In (72), the rise begins with 'know', which rises from 253 to 320 Hz. (67 Hz. total), and continues on 'that', which rises from 344 Hz. to 464 Hz. (120 Hz. total). Because the rise begins on 'know', this word is perceived as prominent. By contrast, in (73), 'know' is quite flat (rising only 9 Hz. from 250 to 259). 'That' is quite flat also (rising only 6 Hz. from 284 to 290). However, there is a 25 Hz. step up from 'know' to 'that'. This upstep seems to localize the perception of the rise onset on 'that', which makes it sound prominent.

30
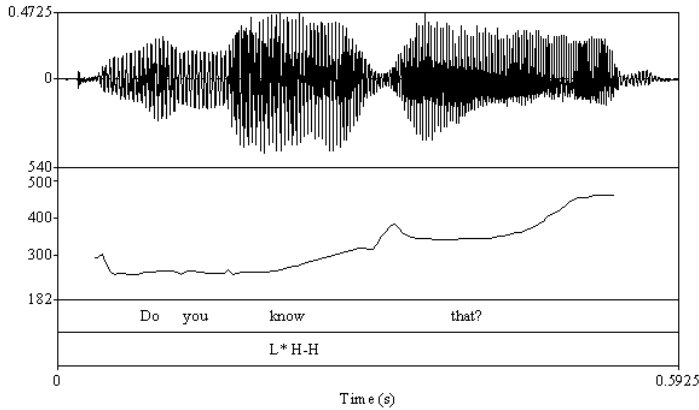
Figure 7:   Final unaccented 'that' (72)
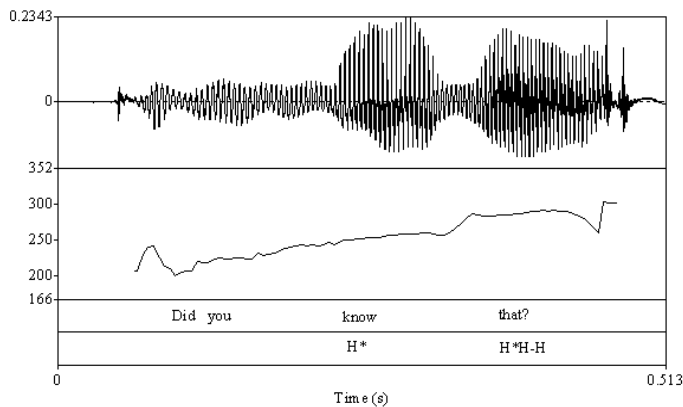
Figure 8:   Final high-accented 'that' (73)

Because the prominence on 'that' in (73) does not appear to be conditioned by information structure, this pitch accent is a post-nuclear accent. This happened twice on 'that', once on 'them', and twice on compounds, always with H*.

In our other examples, too, we found that the pitch movements on pronouns and compound head nouns that we had annotated as unaccented continue a rise that begins on the preceding pitch-accented word. By contrast, the final words that we had annotated with pitch accents exhibit a rise that begins on that word and is independent from any earlier rise.

In some cases, however, the final pronoun appears to be accented for information structure reasons because it is focused in some way. For example, in (74) the referent (the sixth) was mentioned more than 4.5 seconds before the pronoun, and there is an intervening topic shift. The accent is used to direct attention back to the referent for a second topic shift.

(74)   *410.61 412.82 A: Tova's coming the sixth I think*
        410.59 411.03 B: yeah
        413.13 414.77 B: The sixth. Why was she going to (( )) [distortion]
        414.08 416.62 A: yeah and she's going to some relatives or something I don't know
        416.68 417.94 B: uh-huh that's nice
        418.36 418.72 A: yeah

*419.14 420.99 B: uh-huh is **anybody coming** before **that?***
                                  L*   L*   H*H-H%

In other cases, there is contrastive focus on the pronoun, as in (75), where the pattern of prominence on 'I' and 'you' evokes the contextual premise, 'you sound staticky to me'.

(75)   *8.91 14.62 B: {breath} I think this is a really bad connection because, there's a d- there's a little bit of a lag.*
            *15.04 17.39 A: And it's, it's really staticky. Do **I** sound **staticky** to **you?***
                                              L*   H*   H*H-H%

Because the final H* accented pronoun in examples (74)-(75) are focused, we classify these accents as nuclear.

      While the perception of prominence justifying pitch accent annotation seems to be conditioned by multiple factors, including duration, energy and vowel quality, we conclude that pitch rise onset should be taken as the primary criterion for distinguishing pitch accents from unassociated edge tones in yes-no questions. We also propose that the criterion for distinguishing nuclear accents from post-nuclear accents should be that the former but not the latter exhibit information structure focus.

4.2.2.2. Post-nuclear accents in our full set of high-rise yes-no questions. We consulted the transcripts on the remaining 36 question that we had initially classified as high-rise questions to determine if the contextual meaning of these questions warranted characterizing the accent annotated as H* as post-nuclear or nuclear. We found that in 13 cases, the accent is plausibly post-nuclear. For example, in (76), the final focus particle 'too' is accented although it associates with a focus on the subject. Perhaps a second, information focus motivates the accent on 'vegetarian'. In (77) there is narrow focus on the subject, which perhaps gets a high pitch accent because it is a pronoun to mark it as given information.

(76)   *Are **you** a **vegetarian too***
        H%   L*   H*L- H*H-H%

(77)   *But are **they** gonna still come?*
            H*H-H%

      In 23 cases though, we found no justification for treating the final high pitch accent as post-nuclear. Sometimes the item seems to get a high accent because it is given information, as in (78) where the information that the addressee's boyfriend does the cooking is activated.

(78)   *Is **he** a good **cook***
         H*   H*H-H%

In other cases, high pitch at the end of the utterance or throughout the utterance seems to indicate that question is a side question, as in (79)—where the question is marked with 'by the way'—and (80).

(79)   *Uh, did **mother** have a good **time** here by the way*
                    L*+H   H*H-H%

(80)   *Did **Adriana get** a job?*
                H*   !H*   H*H-H%

In several other cases, the high-rise question is the second part of a two-part turn, for example in (81) and (82):

(81)   *yeah okay {breath} I told you about that shampoo did I **tell** you*
                                                                    H*H-H%

(82)   *no i'm not sure can you **explain** that again*
                                    H*H-H%

But in a residue of cases, there does not seem to be any particular reason to mark the question in any particular way, as in (83):

(83)   ***Are** they **selling well***
            L*   H*   H*H-H%

Although some of the questions that we originally identified as high-rise questions now will be realized as low-rise questions with a high post-nuclear accent on a post-focal word, our data indicates that high-rises do occur in American English. But we conclude that this is for information-structural reasons rather than for attitudinal reasons such as marking a question as 'casual' or 'businesslike'. Finally, the 'given' status of many of the pitch accented words in the high-rise nuclear tune also does not seem consistent with Pierrehumbert and Hirschberg (1990)'s characterization of H* as opposed to L* as marking items that the speaker wants to predicate as new information. Nor does it seem that the H* in high-rise questions marks a 'rheme' that is less contentious than the rheme in L* marked low-rise questions, as Steedman (2000, 2007) predicts, unless we can extend the notion of 'non-contentious', as suggested in Section 1.2 above, to include information that both speaker and addressee are already thinking about (i.e. activated material).

5.   Conclusion

In the preceding analysis and discussion, we presented the results of a corpus study designed to examine the distribution and meaning of different intonation patterns on interrogative-form yes-no questions in American English. We concluded that the low-rise nuclear contour is by the far the most frequent pattern and can be considered to be the 'unmarked' question pattern in American English. The two most frequent alternative patterns, the fall and the high-rise, occur for speech act or information structure marking purposes. Thus, falling questions are much less frequent and tend to be used as 'non-genuine' questions, where one or more felicity conditions on the use of questions do not apply, e.g. where the speaker already knows the answer to the question or does not desire an answer to the question. We examined unaccented words at the ends of yes-no questions and labeled these components of the utterance as 'tails'. We found that

lack of accenting at the ends of questions occurs for the same reasons as lack of accenting at the ends of statements: to indicate function words and words that are contextually 'given' in the discourse. Finally we examined high-rises and found that they tend to mark the same types of material that typically occur in tails. We analyze many of these accents as post-nuclear accents. Such final high pitch accents occur on material that would normally be unaccented but for various reasons the high phrase accent edge tone comes to be associated with the lexically stressed syllable in such examples, thus giving rise to an illusion of a high-rise question.

While our primary contribution may thus be the characterization of the intonation of American English yes-no questions in attested discourse, we believe that our findings also have implications for both phonological and semantic/pragmatic theory. Phonologically, we have provided additional evidence from English for the notion of 'post-nuclear accents'. It would useful to incorporate a specific annotation convention for post-nuclear accents into the ToBI system, so that the (a) sentences in (64-68) that we originally annotated as high-rises can correctly be classified as low-rise questions with a high post-nuclear accent. Perhaps a symbol such as a superscript '+" could be adopted for this purpose, so that (64a), for example, repeated here as (84a) could be re-annotated as in (84b).

(84)   a. *Do you **know them**?*
                L* H*H-H%

      b. *Do you **know them**?*
                L* H^+-H%

Finally, our contribution to semantic/pragmatic theory lies in arriving at a better understanding of the nature of intonational meaning. For example, we have found that yes-no questions that have the illocutionary force of genuine requests for information are typically uttered with a low-rise final contour, whereas questions that have a different primary illocutionary forces—such as that of a request for action or an announcement of information—are typically uttered with a falling final contour. Thus, questions that have the illocutionary meaning of typical commands or statements have an intonation to match. Conversely, declarative questions, which have the syntactic structure of statements but the illocutionary force of questions, are uttered with rising intonation, which is canonical to questions. It is illocutionary force, then, rather than syntactic form that determines the final intonation contour in all of these cases.

As for semantic theory, we hope to have made a contribution to the debate over how to characterize the contribution of intonation to the overall meaning of utterances. We have shown that there are problems with all existing accounts that try to derive intonational meaning compositionally from the sequence of different types of high and low tones in an autosegmental annotation system such as ToBI. We believe that important aspects of intonational meaning are associated with whole tunes like the nuclear tunes that we have explored in this article. In this way, we believe that autosegmental accounts and traditional nuclear contour accounts can be reconciled.

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Bionotes

Nancy Hedberg is Professor of Linguistics and Cognitive Science at Simon Fraser University in Burnaby, British Columbia, Canada. She has published on the syntax, semantics and pragmatics of referring expressions, cleft sentences, question prosody, and parenthetical verb expressions, almost always making use of corpus data.

Juan M. Sosa is retired Associate Professor of Linguistics at Simon Fraser University and is currently guest professor in the Doctoral Program in Linguistics at the Universidade Federal de Santa Catarina in Brazil. He has worked extensively in the prosody of Spanish, French, English and Portuguese and is the author of the book *La Entonación del Español*, published in 1999.

Emrah Görgülü is Assistant Professor in the Department of English Language Teaching at İstanbul Sabahattin Zaim University in Turkey. His research interests include semantics and prosody-semantics/pragmatics interface. He has worked on the semantics of nouns in Turkish and the prosody and meaning of yes-no questions and wh-questions in North American English.

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