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# MEANINGS OF TONES AND TUNES

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## 30.1 INTRODUCTION

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WHAT a speaker can be taken to mean often depends in part on the intonation used. Explanations of this fact often invoke the notion of ‘intonational meaning’: that intonational features carry meaning in their own right and in this way contribute to the meaning of the utterance. Intonational meaning can reside in the phrasing of an utterance and, where available, in the melody and in the location of accents in an utterance. This chapter presents a concise introduction to these topics, focusing on the meaning of melody. It aims to provide both an overview of the subfield and a more detailed look at several theoretical and empirical studies, with an eye to the future.

The body of the chapter is organized around a distinction between two kinds of theories of intonational meaning, and their potential reconciliation: generalist and specialist. *Generalist theories* aim to account for the meanings of a wide range of intonation contours (comparable to the ‘abstract’ meanings of Cruttenden 1997: 89). This is typically attempted by assigning basic meanings to a set of phonological building blocks, the intonational morphemes. In contrast, *specialist theories* aim to account, in considerable detail and often with formal explicitness, for the usage of a narrow range of contours, or even only a particular use of a particular type of contour (as in Cruttenden’s ‘local’ meanings). Generalist and specialist theories are not necessarily incompatible. They are most fruitfully regarded, we think, as the starting points of two different approaches that may ultimately meet: a general-to-specific or ‘top-down’ approach, and a specific-to-general or ‘bottom-up’ approach. Proponents of generalist theories may ultimately want their theories to yield predictions on a par in detail to those of specialist theories, and proponents of specialist theories may regard their theories as stepping stones to a more general theory in the future.

After introducing relevant concepts and distinctions in §30.2, we survey several prominent specialist and generalist theories in §30.3. Next, in §30.4, we briefly investigate the extent to which the gap between specialist and generalist theories can be bridged, concentrating

on the role of pragmatics. Lastly, §30.5 reviews empirical work on intonational meaning, relating it to the same challenge, with §30.6 presenting a brief conclusion.

## 30.2 BASIC CONCEPTS FOR THE STUDY OF INTONATIONAL MEANING

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The study of meaning in a strict sense is concerned with what speakers mean when they produce an utterance—say, what they intend to communicate. In a broader sense, it is concerned also with how an audience interprets an utterance, which includes what they take the speaker to mean but may also include any other inferences an audience might draw. Although the difference between intention and interpretation is important, we will follow most of the current literature in using ‘meaning’ in its broader sense.

The study of meaning is often subdivided into ‘semantics’ and ‘pragmatics’. Many characterizations of this division exist (for overviews and discussion see Bach 1997; McNally 2013). A sensible one is what Leech (1983) calls the ‘pragmaticist’s view’, in which semantics covers the linguistic conventions on which the clear communication of what a speaker means relies and pragmatics covers the rest (e.g. what a speaker may reasonably mean to begin with, and how the speaker’s communication relies on a combination of conventions and context). The issue of which meaning components are conventional (or ‘semantic’) and which are not (or ‘pragmatic’) is particularly challenging in the case of intonation (Prieto 2015).

Speakers use intonation to comment on the pragmatic status of their utterance—say, to clarify how the main contribution of the utterance relates to the conversational goals and to the beliefs of speaker and hearer (‘information structure’) (e.g. Brazil et al. 1980; Gussenhoven 1984: 200; Hobbs 1990; Pierrehumbert and Hirschberg 1990). This function is mostly carried by the *linguistically* structured part of intonation, encoded in intonational phonology, which comprises discrete contrasts such as that between H\* and L\*. *Paralinguistic* intonation, by contrast, is expressed by gradient adjustments of the pitch contour (Ladd 2008b: 37), which typically add emotional or evaluative meanings to the linguistic message. Paralinguistic phonetic adjustments vary gradiently with their meaning. For instance, if high pitch register signals indignation, then higher pitch will signal more indignation. This chapter is primarily concerned with the linguistic part of intonational meaning. However, it may at times be hard to tell whether an intonational meaning is linguistic, because some meanings may be expressed either paralinguistically or morphologically, depending on the language (Grice and Baumann 2007). For instance, languages with a single phonological intonation contour for both assertions and questions, such as Hasselt Limburgish (Peters 2008), will signal the difference between the two meanings paralinguistically, by pitch register raising or pitch range expansion for questions (cf. Yip 2002: 260). An added difficulty is that linguistic and paralinguistic intonational meaning may be diachronically related. Paralinguistic intonational meaning has been claimed to derive from various anatomical and physiological influences on intonation.<sup>1</sup> The best known of these influences is the size of the vocal folds, which correlates inversely with their vibration

<sup>1</sup> This does not mean that paralinguistic intonation cannot also be a matter of linguistic convention (Prieto 2015). Dachkovsky (2017) provides an example of the conventionalization of paralinguistic signals up to their ultimate morphemic status in the development of Israeli Sign Language.

frequency and thus with pitch. Ohala's (1983, 1984) Frequency Code accordingly assigns 'small' meanings ('friendly', 'submissive', 'uncertain', etc.) to higher pitch and 'big' meanings ('authoritative', 'aggressive', 'confident', etc.) to lower pitch. Similar connections between sources of variation and meanings have been identified as the Effort Code, the Respiratory Code, and, tentatively, the Sirenic Code (Gussenhoven 2016 and references therein). Paralinguistic uses of high pitch for questions, of expanded pitch range for emphasis, or of final high pitch to signal incompleteness may have developed into morphemes in many languages, as in the case of interrogative H% (a reflection of the Frequency Code), focus-marking pitch accents (the Effort Code), and H% for floor-keeping (the Respiratory Code), respectively (Gussenhoven 2004: 89).

To move on to linguistic intonation, Pierrehumbert (1980) aimed at formulating a *phonological* grammar to account for the contrastive intonation forms of English (see chapters 4 and 19). The possibility of a *morphological* analysis (i.e. a parsing of the phonologically well-formed strings of tones into meaning-bearing units) was only hinted at, but concrete proposals were made in numerous subsequent theories of intonational meaning, some of which will be discussed in §30.3. Theories of intonational meaning may differ in (i) the presupposed phonological analysis, (ii) the way the phonemes are grouped into morphemes, and (iii) the meanings assigned to these morphemes. Unless the size of these morphemes encompasses the intonational phrase or the utterance, intonational meaning is 'compositional'—that is, arises from the combination of the meanings of the various morphemes (Pierrehumbert and Hirschberg 1990). Controversial elements in their phonological analysis concern the existence of the intermediate phrase (ip) and its final boundary tones H- and L-, the internal composition of pitch accents, and the obligatory status of the final boundary tone (for discussion and references, see Ladd 2008b: ch. 4; Gussenhoven 2016; see also chapter 19). In §30.3 we will discuss several ways in which theories of intonational meaning may help to shed light on phonological issues.

### 30.3 GENERALIST AND SPECIALIST THEORIES OF INTONATIONAL MEANING

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#### 30.3.1 Generalist theories

Accounts of intonational *phonology* have been proposed for many languages, and often come paired with a coarse characterization of intonational *meaning*, typically in terms of the kinds of speech acts (e.g. question vs. assertion), their turn-taking effects (e.g. continuation vs. completeness), and speaker attitudes (e.g. surprise, uncertainty, incredulity, authoritativeness) with which various contours may typically occur (see, for instance, collections such as Hirst and Di Cristo 1998; Jun 2005a, 2014a; for turn-taking specifically, see chapter 32; see also Park 2013 for Korean). More systematic and explanatory theories of intonational meaning are rarer; they have been developed primarily for English, and we will concentrate on these in what follows. For generalist theories of intonational meaning for other languages see, for example, Portes and Beyssade (2012) for French and Kügler (2007a) for German (Swabian and Upper Saxon).

With regard to English, there is considerable agreement about the meaning of final rising pitch, despite some differences as to whether this meaning is contributed by a high boundary

tone (H%), a rising accent (L\*H), its high trailing tone (or a phrase accent H-), or some combination (e.g. L\*H H%). The meaning of a final rise is commonly construed either as ‘incompleteness’ (e.g. Bolinger 1982; Hobbs 1990; Westera 2013; Schlöder and Lascarides 2015) or in terms of what may be consequences of (or explanations for) incompleteness, such as ‘testing’ (Gussenhoven 1984), ‘questioning’ (Bartels 1999 and Truckenbrodt 2012, with regard to H-), ‘suspending judgement’ in some respect (Imai 1998), raising a ‘metalinguistic issue’ (Malamud and Stephenson 2015), being ‘forward-looking’ or ‘continuation-dependent’ (Pierrehumbert and Hirschberg 1990; Bartels 1999; Gunlogson 2008; Lai 2012), and placing some responsibility on or effecting an engagement of the addressee (Gunlogson 2003; Steedman 2014; see also chapter 19). This range of characterizations could in principle reflect differences in empirical focus among the various authors, rather than essential differences in the supposed meaning of the rise.<sup>2</sup>

There is also considerable agreement that a plain falling contour in English should in some sense mean the opposite of a rise. A distinction can be drawn, however, between theories—most of the aforementioned ones—according to which a fall would convey the strict negation of the rise (e.g. ‘completeness’, ‘continuation-independence’), and theories that instead consider the fall a meaningless default, such as in Hobbs (1990) and Bartels (1999), where L% conveys not the intention to convey the negation of what H% conveys, but merely the absence of the intention to convey what H% conveys. Which approach is more plausible depends in part on which theory of intonational phonology one assumes. For instance, in ToBI, boundaries are either H% or L%, so it would make sense if one of the two were the meaningful default. But if, as in Ladd (1983: 744), Grabe (1998b), and Gussenhoven (2004), final boundaries can also be toneless, it seems more natural to treat the toneless boundary as the meaningless default and the low boundary tone as the strict negation of the high boundary tone, as in most accounts (including several that are in fact based on ToBI). And the picture may be different again if one understands ToBI as providing a four-way boundary distinction (i.e. L-L%, L-H%, H-L%, H-H%).

As for (pitch) accents, there seems to be a consensus that accents (cross-linguistically) serve to mark words that are ‘important’ in some sense—we will discuss this separately in §30.3.2. There is less agreement about what the meanings of the different *kinds* of accents would be (for a more detailed overview see chapter 33; see also Büring 2016: ch. 9). According to some authors, the distinction between rising and falling accents in English mirrors that between final rises and falls (e.g. Gussenhoven 1984; Hobbs 1990; Westera 2019). For instance, Hobbs assumes that boundary tones indicate the (in)completeness of an intonational phrase while trailing tones indicate the (in)completeness of an accent phrase. Other authors do not assume such similarity (e.g. Pierrehumbert and Hirschberg 1990; Steedman 2014); for example, Steedman treats (ToBI-style) boundary tones as signalling agency of speaker ((H/L)L%) versus hearer ((H/L)H%), and assigns meanings to accents on the basis of two other dimensions: (i) whether the material conveyed by the accented phrase is ‘thematic’ (i.e. supposed to be common ground) or ‘rhematic’ (i.e. intended to update the common ground), which is similar to Brazil’s (1997) ‘referring’ versus ‘proclaiming’ or Gussenhoven’s (1984) ‘selection’ versus ‘addition’ (cf. Cruttenden 1997: 108), and (ii) if

<sup>2</sup> It has been proposed, perhaps in contrast, that the ‘incompleteness’ and ‘questioning’ uses of the final rise stem from different biological codes (Gussenhoven 2004; cf. §30.2). For a recent example and discussion of two meanings for a single form of the final rise in declaratives, see Levon (2018).

**Table 30.1** Information–structural meanings of pitch accents (Steedman 2014)

|                    | Success  | Failure  |
|--------------------|----------|----------|
| Thematic (suppose) | L+H*     | L*+H     |
| Rhematic (update)  | H*, H*+L | L*, H+L* |

this supposition or update is successful or unsuccessful. Relative to these two binary distinctions, Steedman locates the ToBI accents as in Table 30.1.

Together with Steedman's (2014) treatment of the boundary tones, this results in intricate meanings—for example, for the contour L\*+H H-H% that 'the hearer fails to suppose that the accented material is common ground'. What this means depends of course on a theory of notions such as supposition and common ground—we return to this dependence in §30.4. For now, note that Steedman's distinction between the rows in Table 30.1 is one between rising accents and non-rising accents, while the distinction between the columns concerns the location of the 'star', such that H\* signals success and L\* failure (unlike the more common generalization that H\*/L\* conveys newness/givenness; e.g. Pierrehumbert and Hirschberg 1990). Within ToBI, this organization may appear quite natural. But within Gussenhoven's (2004) phonology this apparent naturalness disappears. For one thing, Gussenhoven's theory does not draw a distinction between L+H\* and H\* (top left and bottom left of Table 30.1), taking the first to be an emphatic pronunciation of the second (cf. Ladd 2008b: 96). Moreover, ToBI's L\*+H (top right) may correspond in Gussenhoven's theory either to a rising accent L\*H or to a high accent (H\*/H\*L) that is *delayed* by means of an independently meaningful L\* prefix, with retention of the semantic characteristics of the unprefixated pitch accent (L\*HL; cf. Gussenhoven 2016; §3.5). The second case follows the more generally assumed morphemic status of what has been discussed for English as 'scoop' (Vanderslice and Pierson 1967; Vanderslice and Ladefoged 1972: 1053), 'delayed peak' (Ladd 1983), or [Delay] (Gussenhoven 1983b), and as 'late peak' for German (Kohler 1991, 2005). So what is a single morphological operation in one analysis would correspond in Steedman's (2014) theory to a difference along two semantic dimensions. Thus, again we see that a theory of intonational meaning depends (through one's morphological analysis) in part on one's intonational phonology.

### 30.3.2 Specialist theories

Specialist theories aim to account for (a particular usage of) a particular intonational feature or contour in considerable detail, often using tools from formal semantics and pragmatics. These theories have been applied to a number of different melodic features, among them (i) utterance-final rises in declarative sentences (e.g. Gunlogson 2003; Nilsenova 2006; Truckenbrodt 2006; Gunlogson 2008), (ii) accentuation and focus (e.g., among many, Rooth 1985, 1992; Roberts 1996/2012), (iii) particular uses of rise-fall-rise (RFR) (e.g. Ward and Hirschberg 1985; Büring 2003; Constant 2012), (iv) stylized intonation (Ladd 1978), (v) rises and falls in lists (e.g. Zimmermann 2000), and (vi) utterance-final rises and falls in questions (e.g. Roelofsen and van Gool 2010; Biezma and Rawlins 2012). We will discuss a number of examples in more detail.



- (3) A: Il y a pas de volets quoi.  
 ‘There are no shutters.’  
 B: Ah oui ils y ont des rideaux hein.  
 L+H\* L- L%  
 ‘Ah yes they have curtains don’t they.’

Other specialist accounts rely not on the notion of QUD but on ‘epistemic’ notions such as discourse commitment, speaker bias, and contextual evidence—intonation thus seems to reflect the interlocutors’ goals (e.g. QUDs) as well as their epistemic states. Among these we find, for instance, a rich literature on English rising declaratives (e.g. Gunlogson 2003, 2008; Nilsenova 2006; Truckenbrodt 2006; Trinh and Crnić 2011; Farkas and Roelofsen 2017), an account of question intonation in Catalan (Prieto and Borràs-Comes 2018), and an account of the contradiction contour in English (Goodhue and Wagner 2018; for an earlier account, see e.g. Bolinger 1982). We summarize Goodhue and Wagner’s account for concreteness. According to Liberman and Sag (1974), the contradiction contour requires some kind of contradiction, but Pierrehumbert and Hirschberg (1990) criticize this characterization for being too vague and incorrectly permissive of examples such as (4) (cf. Pierrehumbert and Hirschberg’s 1990: ex. (20), p. 293).

- (4) A: There are mountain lions around here.  
 B: # Alvarado said there are no mountain lions around here.  
 %H (L\*) L\* L- H%

Goodhue and Wagner (2018) offer a more precise characterization of the contradiction contour as requiring *contextual evidence* against the proposition expressed. For instance, A’s utterance in (5) provides contextual evidence both for the proposition that A asserts and for the proposition embedded under the verb *said*, hence against the content of B’s utterances in both (5a) and (5b), licensing the contradiction contour in each.

- (5) A: Alvarado said there are mountain lions around here.  
 a. B: No he didn’t.  
 %H L\* L-H%  
 b. B: There aren’t any mountain lions around here.  
 %H (L\*) L\* L- H%

In contrast, in (4) there is no contextual evidence against the proposition expressed by B, hence the contour is not licensed.

### 30.4 TOWARDS UNIFYING GENERALIST AND SPECIALIST THEORIES

Despite their successes, both specialist theories and generalist theories have limitations. Specialist theories can generate precise predictions, but only for a narrow empirical domain and from relatively costly assumptions. Generalist theories have a broader scope but generate less precise predictions, perhaps to such an extent that generalist theories are not really

falsifiable. According to Ladd (2008b: 150), this is primarily because such theories rely on an underdeveloped theory of pragmatics. For instance, the claim that a particular pitch accent marks selection from a common background (Brazil 1997; Gussenhoven 1984) is difficult to falsify in the absence of a pragmatic theory that defines the conditions under which selection from a common ground would be a rational, cooperative thing to do (see Büring 2012 for a congenial criticism of generalist theories with regard to accent placement). Perhaps specialist and generalist theories can be regarded as the starting points of two approaches to intonational meaning, a specific-to-general and a general-to-specific approach. Reconciling these requires investigating how the ingredients of specialist accounts can be generalized to or derived from the assumptions of generalist accounts, for instance through a theory of pragmatics.

To illustrate this, consider the suggestions contained in some specialist theories of English rising declaratives for fitting their proposed meanings into a more generalist account. For instance, Gunlogson (2008) proposes to regard her specialist treatment in terms of a ‘contingent commitment’ as a special case of a more generalist treatment of all rising declaratives as contingent discourse moves, and sketches how certain features of the context may guide an audience’s understanding to the more specific meaning (though see Nilsenova 2006 for criticism). Similarly, Malamud and Stephenson (2015) suggest that their specialist treatment, which builds on Gunlogson’s, could be regarded as instantiating the more generalist account of all rising declaratives as raising a metalinguistic issue. For a general-to-specific approach to rising declaratives, one could instead start from the generalist assumption that the rising intonation signals ‘incompleteness’ and try to make this more precise in terms of what it means for an utterance to be incomplete. If it is understood as ‘incompleteness given the goals of cooperative conversation’, this could be explicated for instance in terms of suspending one of Grice’s (1975) maxims of conversation (Westera 2013, 2018) or in terms of the required existence of some future discourse segment (Schlöder and Lascarides 2015). To illustrate the approach based on maxim suspensions, note that one can find or construct a rising declarative for each of the maxims, as in (6) to (9) (examples, respectively, from Gunlogson 2003; Pierrehumbert 1980; Westera 2013; Malamud and Stephenson 2015).

- (6) (*To someone entering the room with an umbrella.*) It’s raining? (H%)
- (7) (*To a receptionist.*) Hello, my name is Mark Liberman. (H%)
- (8) (*English tourist in a French café.*) I’d like... err... je veux... a black coffee? (H%)
- (9) (*B isn’t sure if A wants to know about neighbourliness or suitability for dating.*)  
 A: What do you think of your new neighbour?  
 B: He’s attractive? (H%)

The final rise in (6) seems to convey that the speaker is uncertain about the truth of the proposition expressed (suspending the maxim of Quality, which demands certainty in this regard), in (7) about whether the information provided is sufficient (suspending Quantity), in (8) about whether it was comprehensible (suspending Manner), and in (9) about whether the information was relevant to the preceding question (suspending Relation). Moreover, conceiving of final rises in terms of maxim suspensions can help to explain additional characteristics. For instance, Quality-suspending examples like (6) are known to express a speaker bias: the truth of the proposition expressed must be deemed sufficiently likely. This is plausibly because one should not risk violating an important maxim like



Quality (i.e. risk uttering a falsehood), unless its falsehood is considered sufficiently unlikely (Westera 2018). In this way, by explicating relevant parts of a pragmatic theory, one can derive particular ingredients of specialist accounts from a generalist characterization.

A topic where a similar reconciliation of specialist and generalist accounts through prag-matics seems underway is accentuation and focus. For instance, specialist theories of focus, such as Selkirk's (1995) influential account, can be simplified and potentially improved by placing part of the burden of accent placement not on syntactic stipulations but on prag-matics (Schwarzschild 1999; Büring 2003; Beaver and Velleman 2011). And Rooth's (1985) specialist theory of focus sensitivity (of words such as *only*) has been restated in terms of the pragmatic notion of QUD (Beaver and Clark 2009, following Roberts 2012/1996 and others).

### 30.5 EXPERIMENTAL WORK ON INTONATIONAL MEANING

Experimental work on intonational meaning encompasses both corpus research and behavioural experiments. Corpus research offers the advantage of spontaneous speech, but it does not enable one to precisely and repeatedly control for subtle pragmatic factors; experiments offer better opportunities for control, but at the cost of less spontaneous data. For reasons of space, we only review some behavioural experimental work in what follows, pointing the reader interested in corpus work to Calhoun et al. (2010, and references contained therein).

Experiments may involve *production* and *perception* data. In production experiments, utterances are recorded that are produced by participants in response to stimuli, such as a short discourse or a description of the sort of meaning that is to be expressed. The recordings are then annotated for intonation. The goal is to discover manipulations of stimuli that reliably affect intonational behaviour (e.g. Hirschberg and Ward 1992; González-Fuente et al. 2015; Goodhue et al. 2016; Klassen and Wagner 2017). For instance, Goodhue et al. (2016) sought to demonstrate the existence of different rising contours in English with dis-tinct meanings. Participants were asked to produce a single sentence in three different con-texts. In (10), this sentence is *You like John*, to be uttered in response to (10a) so as to contradict an interlocutor, to insinuate something in response to (10b), or to express disbe-lief or incredulity in response to (10c).

- (10) a. (*Your friend Emma spent the whole day with John yesterday and you know for a fact that she likes him.*)  
Emma: So yesterday Sarah asked me if I was going to John's birthday party and I said no, I don't even like him.
- b. (*You know your friend John is attending the party, and you know Emma knows and likes him, but you're not sure whether she'll like anyone else.*)  
Emma: I don't feel like going to this party tonight, I have the feeling I might not like any of the people there.
- c. (*Just the other day your friend Emma was bad-mouthing John, so you know for a fact that she doesn't like him.*)  
Emma: Yesterday Sarah kept saying mean things about John and I was really uncomfortable because John's a nice guy, I really like him.

Each context reliably elicited distinct rising contours, with (10a) eliciting the contradiction contour, (10b) the RFR contour, and (10c) emphatic question rises. Specialist accounts could in principle model this outcome with relative ease, especially if they were to treat each of these contours non-compositionally as a single morpheme, as in the original proposal by Liberman and Sag (1974) for the contradiction contour. Generalist accounts would have to cover a potentially broader range of uses of these contours (or their morphemes), and explain through a pragmatic theory how the contexts in (10) enable the participants to reliably convey the meanings they were asked to convey. Without a sufficiently precise pragmatic theory, generalist theories in particular are difficult to evaluate empirically.

In perception experiments, participants hear utterances, again often in context, and are given tasks that are intended to shed light on how intonation affects interpretation. For instance, they may be asked to respond to questions such as ‘How natural is this utterance on a scale of 1 to 7?’, ‘Is this utterance true or false?’, ‘How different are the meanings of these contours?’, or ‘Does this utterance mean X or Y?’ (e.g. among many others, Nash and Mulac 1980; Gussenhoven and Rietveld 1991; Hirschberg and Ward 1992; Chen et al. 2004a; Watson et al. 2008b; Portes et al. 2014; Jeong and Potts 2016; Goodhue and Wagner 2018). Let us consider De Marneffe and Tonhauser (2016) as an example to illustrate that relating empirical findings to theory is not straightforward. Many theories of English RFR treat the contour as cancelling or weakening exhaustivity inferences—that is, inferences that stronger answers to the QUD are false (e.g. Tomioka 2010; Constant 2012; Wagner 2012b). In apparent contrast to these theories, De Marneffe and Tonhauser discovered that when B’s answer in (11) is pronounced with RFR, the answer is less likely to be interpreted as an affirmative answer to the question (i.e. as meaning ‘beautiful’) than when it is pronounced with a plain falling contour.

- (11) A: Is your sister beautiful?  
 B: She’s attractive...  
           L\*+H L-       H%

De Marneffe and Tonhauser’s interpretation of their results is that RFR strengthens the ‘not beautiful’ interpretation, which would amount to strengthening an exhaustivity inference rather than weakening it, in apparent contrast to the aforementioned accounts of RFR. However, this conclusion seems to rely on two implicit assumptions about the pragmatics of cases such as (11), the plausibility of which is difficult to assess without a detailed pragmatic theory. One is that B’s response must be interpreted either as an affirmative or as a negative answer to A’s question (as opposed to, e.g., ‘I don’t know’ or ‘it depends’)—for otherwise its affirmative interpretation being less likely does not necessarily imply that its negative interpretation is more likely (i.e. that its exhaustivity inference is strengthened). In other words, depending on one’s theory of pragmatics, the results are consistent with participants drawing an ignorance inference rather than an exhaustivity inference. Another assumption is that the non-exhaustivity predicted by existing accounts would necessarily pertain to A’s question and not, say, to some higher, implicit QUD such as ‘Could your sister be a model?’, a possibility acknowledged by Wagner (2012b; though contrary to Tomioka 2010 and Constant 2012). For, although (11) makes part of the context explicit through A’s question, it leaves implicit why this question was asked. Moreover, Kadmon and Roberts (1986) note that different intonation contours may favour different understandings of implicit parts of the context—say, of the implicit, higher QUD in (11)—further complicating the

interpretation of experimental results. This stresses again the importance of pragmatics for the study of intonational meaning—or, conversely, that given a certain theory of intonational meaning, experiments may offer an important window on pragmatics.

## 30.6 CONCLUSION

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There is agreement that intonation has a linguistically structured component with phonology, morphology, and basic meanings for the morphemes, and that this component serves to clarify the pragmatic status of utterances in various ways. There is also some agreement with regard to generalist characterizations of the meanings of utterance-final contours (e.g. in terms of pragmatic ‘(in)completeness’), and proposals exist to make these generalist characterizations more precise with the help of advances in pragmatics. With regard to (the various ingredients of) more complex contours, however, much remains to be discovered. A lack of consensus about the meanings of various accent types is due in part to (and also a partial cause of) disagreement about what the phonemes are and even more so what the morphemes are, even for the intensively studied West Germanic languages. It is also due in part to the difficulty of testing theories of intonational meaning, but there again, advances in pragmatic theory will lead to a better understanding.

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## References

- Bach, Kent (1997). The semantics-pragmatics distinction: What it is and why it matters. In Rolf E. (ed.), *Pragmatik, Linguistische Berichte (Forschung Information Diskussion)*. Wiesbaden: VS Verlag für Sozialwissenschaften, 33–50.
- Bartels, Christine (1999). *The Intonation of English Statements and Questions: A Compositional Interpretation*. New York: Routledge.
- Beaver, D. and B. Clark (2009). *Sense and Sensitivity: How Focus Determines Meaning*. Explorations in Semantics 12. Oxford: John Wiley and Sons.
- Beaver, D. and D. Velleman (2011). The communicative significance of primary and secondary accents. *Lingua* 121 (11): 1671–1692.
- Biezma, Maria and Kyle Rawlins (2012). Responding to alternative and polar questions. *Linguistics and Philosophy* 35 (5): 361–406.
- Bolinger, Dwight L. (1982). Intonation and its parts. *Language* 58: 505–532.
- Brazil, David (1985). *The communicative value of intonation in English*. Birmingham: Bleak House Books and English Language Research.
- Brazil, David, Malcolm Coulthard, and Catherine Johns (1980). *Discourse Intonation and Language Teaching*. London: Longman.
- Büring, Daniel (2003). On D-trees, Beans, and Accents. *Linguistics and Philosophy* 26: 511–545.
- Büring, Daniel (2012). Focus and Intonation. In Gillian Russell and Delia Graff Fara (eds), *Routledge Companion to the Philosophy of Language*. London: Routledge, 103–115.
- Büring, Daniel (2016). *Intonation and Meaning*. Oxford: Oxford University Press.
- Calhoun, Sasha, Jean Carletta, Jason M. Brenier, Neil Mayo, Dan Jurafsky, Mark Steedman, and David Beaver (2010). The NXT-format Switchboard Corpus: A rich resource for investigating the syntax, semantics, pragmatics and prosody of dialogue. *Language Resources and Evaluation* 44(4): 387–419.
- Chen, Aaju, Carlos Gussenhoven, and Toni Rietveld (2004). Language specificity in the perception of paralinguistic intonational meaning. *Language and Speech* 47: 311–349.
- Chen, Aaju, Els den Os, Jan-Peter de Ruiter (2007). Pitch accent type matters for online processing of information status: Evidence from natural and synthetic speech. *The Linguistic Review* 24: 317–344.
- Constant, Noah (2012). English rise-fall-rise: A study in the semantics and pragmatics of intonation. *Linguistics and Philosophy* 35(5): 407–442.
- Cruttenden, Alan (1997). *Intonation (2<sup>nd</sup> edition)*. Cambridge: Cambridge University Press.

De Marneffe, Marie-Catherine and Judith Tonhauser (2016). Inferring meaning from indirect answers to polar questions: The contribution of the rise-fall-rise contour. In E. Onea, M. Zimmermann, and K. von Heusinger (eds), *Questions in Discourse, Current Research in the Semantics/Pragmatics interface*.

Dretske, Fred I. (1972). Contrastive Statements. *Philosophical Review* 81(4):411–437. DOI: 10.2307/2183886

Farkas, Donka F. and Floris Roelofsen (2017). Division of labor in the interpretation of declaratives and interrogatives. *Journal of Semantics* 34(2): 1–53. DOI: 10.1093/jos/ffw012.

González-Fuente, Santiago, Susagna Tubau, M. Teresa Espinal, and Pilar Prieto (2015). Is there a universal answering strategy for rejecting negative propositions? Typological evidence on the use of prosody and gesture. *Frontiers in Psychology* 6(899): 1–17.

Goodhue, Daniel, Lyana Harrison, Y. T. Clémentine Su and Michael Wagner (2016). Toward a bestiary of English intonational contours. In Brandon Prickett and Christopher Hammerly (eds), *The Proceedings of the North East Linguistics Society (NELS)* 46: 311–320.

Goodhue, Daniel and Michael Wagner (2018). Intonation, *yes* and *no*. *Glossa* 3(1):5, 1–45. DOI: 10.5334/gjgl.210.

Grabe, Esther (1998). *Comparative Intonational Phonology: English and German*. MPI Series in Psycholinguistics 7, Wageningen: Ponsen en Looien.

Grice, H. Paul (1975). Logic and conversation. In P. Cole and J. Morgan (eds), *Syntax and semantics 3: Speech acts*. New York: Academic Press, 41–58.

Grice, Martine, Stefan Baumann (2007). An introduction to intonation-functions and models. In Jürgen Trouvain and Ulrike Gut (eds). *Non-native Prosody: Phonetic Description and Teaching Practice*. Berlin: De Gruyter, 25–51.

Gunlogson, C. (2003). *True to Form: Rising and Falling Declaratives as Questions in English*. New York: Routledge.

Gunlogson, Christine (2008). A question of commitment. *Belgian Journal of Linguistics* 22: 101–136.

Gussenhoven, Carlos (1984). *On the Grammar and Semantics of Sentence Accents*. Publications in Language Sciences 16. Berlin/New York: De Gruyter Mouton.

Gussenhoven, Carlos (1992). Sentence accents and argument structure. In Iggy Roca (ed.), *Thematic Structure: Its Role in Grammar*. Berlin: Foris, 91–106.

Gussenhoven, Carlos (2004). *The Phonology of Tone and Intonation*. Cambridge: Cambridge University Press.

Gussenhoven, Carlos (2016). Analysis of Intonation: the Case of MAE\_ToBI. *Laboratory Phonology: Journal of the Association for Laboratory Phonology* 7(1): 10 (1–35). DOI: <http://dx.doi.org/10.5334/labphon.30>.

- Gussenhoven, Carlos and A.C.M. Rietveld (1991). An experimental evaluation of two nuclear tone taxonomies. *Linguistics* 29: 423–449.
- Hayes, Bruce and Aditi Lahiri (1991). Bengali intonational phonology. *Natural Language and Linguistic Theory* 9(1): 47–96.
- Hirschberg, Julia and Gregory Ward (1992). The influence of pitch range, duration, amplitude and spectral features on the interpretation of the rise-fall-rise intonation contour in English. *Journal of Phonetics* 20: 241–251.
- Hirst, Daniel and Albert Di Cristo (ed.) (1998). *Intonation Systems: A Survey of Twenty Languages*. Cambridge: Cambridge University Press.
- Hobbs, Jerry R. (1990). The Pierrehumbert-Hirschberg Theory of intonational meaning made simple: Comments on Pierrehumbert and Hirschberg. In Philip R. Cohen, Jerry Morgan, and Martha E. Pollack (eds), *Intentions in Communication*. Cambridge, MA: MIT Press, 313–323.
- Imai, Kunihiro (1998). Intonation and relevance. In R. Carston and S. Uchida (eds), *Relevance Theory: Applications and implications*. Pragmatics and Beyond New Series 37. John Benjamins Publishing Co., 69–86.
- Jackendoff, Ray S. (1972). *Semantic Interpretation in Generative Grammar*. Cambridge, MA: MIT Press.
- Jeong, Sunwoo and Christopher Potts (2016). Intonational sentence-type conventions for perlocutionary effects: An experimental investigation. In Mary Moroney, Carol-Rose Little, Jacob Collard, and Dan Burgdorf (eds), *Proceedings of Semantics and Linguistic Theory 26 (SALT 26)*: 1–22.
- Jun, Sun-Ah (ed.) (2005). *Prosodic Typology. The Phonology of Intonation and Phrasing*. Oxford: Oxford University Press.
- Jun, Sun-Ah (ed.) (2014). *Prosodic Typology II. The Phonology of Intonation and Phrasing*. Oxford: Oxford University Press.
- Kadmon, Nirit and Craige Roberts (1986). Prosody and Scope: The Role of Discourse Structure. In A.M. Farley, P.T. Farley, and K.-E. McCullough (eds), *Chicago Linguistic Society (CLS) 22: Papers from the Parasession on Pragmatics and Grammatical Theory*: 16–28.
- Klassen, Jeffrey and Michael Wagner (2017). Prosodic prominence shifts are anaphoric. *Journal of Memory and Language* 92: 305–326.
- Kügler, Frank (2007). *The Intonational Phonology of Swabian and Upper Saxon*. Tübingen: Max Niemeyer.
- Ladd, D. Robert (1978). Stylized intonation. *Language*: 517–540.
- Ladd, D. Robert (1983). Phonological features of intonational peaks. *Language* 59: 721–759.

- Ladd, D. Robert (2008). *Intonational phonology*. 2nd ed. Cambridge: Cambridge University Press.
- Ladd, D. Robert and Rachel Morton (1997). The perception of intonational emphasis: Continuous or categorical? *Journal of Phonetics* 25: 313–342.
- Lai, C. (2012). *Rises all the way up: The interpretation of prosody, discourse attitudes and dialogue structure*. PhD dissertation. University of Pennsylvania.
- Leech, Geoffrey (1983). *Principles of Pragmatics*. London: Longman.
- Levon, Erez (2018). Same difference: The phonetic shape of High Rising Terminals in London. *English Language and Linguistics*. <https://doi.org/10.1017/S1360674318000205>
- Lieberman, M. and I. Sag (1974). Prosodic form and discourse function. In M. W. La Galy, R. A. Fox, and A. Bruck (eds), *Proceedings of the Chicago Linguistic Society (CLS)* 10, 402–415.
- Malamud, Sophia and Tamina Stephenson (2015). Three ways to avoid commitments: Declarative force modifiers in the conversational scoreboard. *Journal of Semantics* 32(2): 275–311.
- McNally, Louise (2013). Semantics and pragmatics. *Wiley Interdisciplinary Reviews: Cognitive Science* 4: 285-297. Doi: 10.1002/wcs.1227.
- Nash, R. and A. Mulac (1980). The intonation of verifiability. In Linda R. Waugh and C.H. van Schooneveld (eds), *The melody of language: Intonation and prosody*. Baltimore: University Park Press, 219–241.
- Nilsenova, Maria (2006). *Rises and Falls. Studies in the Semantics and Pragmatics of Intonation*. PhD dissertation. ILLC, University of Amsterdam.
- Ohala, John J. (1983). Cross-language use of pitch: An ethological view. *Phonetica* 40(1): 1–18.
- Ohala, John J. (1984). An ethological perspective on common cross-language utilization of f0 of voice. *Phonetica* 41: 1–16.
- Park, Mee-jeong (2013). *The Meaning of Korean Prosodic Boundary Tones*. Leiden: Brill.
- Peters, Jörg (2008). Tone and intonation in the dialect of Hasselt. *Linguistics* 46: 983–1018.
- Pierrehumbert, Janet B. (1980). *The Phonology and Phonetics of English Intonation*. PhD dissertation, MIT. Distributed 1988, Indiana University Linguistics Club.
- Pierrehumbert, Janet B. and Julia Hirschberg (1990). The meaning of intonational contours in the interpretation of discourse. In Philip R. Cohen, Jerry L. Morgan and Martha E. Pollack (eds), *Intentions in Communication*. Cambridge, MA: MIT Press, 271–311.
- Portes, Cristel and Claire Beyssade (2012). Is intonational meaning compositional? *Verbum* 24, unpaginated. [http://www.lpl-aix.fr/~c3i/doc/PortesBeyssade\\_2014](http://www.lpl-aix.fr/~c3i/doc/PortesBeyssade_2014)
- Portes, Cristel, Claire Beyssade, Amandine Michelas, Jean-Marie Marandin, and Maud Champagne-Lavau (2014). The dialogical dimension of intonational meaning: Evidence from

French. *Journal of Pragmatics* 74(Supplement C): 15–29.

Portes, Cristel and Uwe Reyle (2014). The meaning of French “implication” contour in conversation. In Nick Campbell, Dafydd Gibbon, and Daniel Hirst (eds) *Proceedings of the 7th International Conference on Speech Prosody*, 413–417.

Post, Brechtje, Iwo Bohr, Chris Cummins, Francis Nolan, Toby Hudson, and Emmanuel Stamatakis (under revision). Question or surprise? The neural networks underpinning the processing of linguistic and paralinguistic information in intonation. *Journal of Cognitive Neuroscience*.

Prieto, Pilar (2015). Intonational meaning. *Wiley Interdisciplinary Reviews: Cognitive Science* 6: 371–381. Doi: 10.1002/wcs.1352

Prieto, Pilar and Borràs-Comes (2018). Question intonation contours as dynamic epistemic operators. *Natural Language and Linguistic Theory*.

Roberts, C. (2012). Information structure in discourse: Towards an integrated formal theory of pragmatics. *Semantics and Pragmatics* 5(6):1–96. Publication of a 1996 manuscript.

Roelofsen, F. and S. van Gool (2010). Disjunctive Questions, Intonation, and Highlighting. In M. Aloni, H. Bastiaanse, T. de Jager, and K. Schulz (eds), *Logic, Language, and Meaning: Selected Papers from the Seventeenth Amsterdam Colloquium*. New York: Springer, 384–394.

Rooth, Mats (1985). Association with Focus. PhD dissertation. Amherst: University of Massachusetts.

Rooth, Mats (1992). A Theory of Focus Interpretation. *Natural Language Semantics* 1: 75–116.

Schlöder, Julian and Alex Lascarides (2015). Interpreting English pitch contours in context. In Christine Howes and Staffan Larsson (eds), *Proceedings of 19th workshop on the semantics and pragmatics of dialogue (SemDial 19)*, 131–139.

Schwarzschild, Roger (1999). GIVENness, AvoidF and Other Constraints on the Placement of Accent. *Natural Language Semantics* 7: 141–177.

Selkirk, Elisabeth (1995). Sentence Prosody: Intonation, Stress, and Phrasing. In J. A. Goldsmith (ed.), *The Handbook of Phonological Theory*. Cambridge: Blackwell, 550–569.

Steedman, Mark (2014). The Surface Compositional Semantics of English Intonation. *Language* 90: 2–57.

Tomioka, Satoshi (2010). A scope theory of contrastive topics. *Iberia: An International Journal of Theoretical Linguistics* 2(1): 113–130.

Trinh, T. and L. Crnić (2011). On the rise and fall of declaratives. In I. Reich, E. Horch, and D. Pauly (eds), *Proceedings of Sinn und Bedeutung (SuB) 15*, 1–16. Universaar – Saarland University Press.

Truckenbrodt, Hubert (2006). On the semantic motivation of syntactic verb movement to C in



German. *Theoretical Linguistics* 32(3): 257–306.

Truckenbrodt, Hubert (2012). Semantics of intonation. In Claudia Maienborn, Klaus von Stechow, and Paul Portner (eds), *Semantics. An International Handbook of Natural Language Meaning. Vol. 3*. Berlin: de Gruyter, 2039–2969.

Vanderslice, R. and Peter Ladefoged (1972). Binary suprasegmental features of English and transfromational word-accentuation rules. *Language* 48: 819–838.

Vanderslice, R. and Lesley S. Pierson (1967). Prosodic features of Hawaiian English. *Quarterly Journal of Speech* 53: 156–166.

Wagner, Michael (2012). Contrastive topics decomposed. *Semantics and Pragmatics* 5(8), 1–54.

Ward, Gregory and Julia Hirschberg (1985). Implicating uncertainty: the pragmatics of fall-rise intonation. *Language* 61(4): 747–776.

Watson, Duane G., Michael K. Tanenhaus, and Christine A. Gunlogson (2008). Interpreting pitch accents in online comprehension: H\* vs. L+H\*. *Cognitive Science* 32: 1232–1244.

Westera, Matthijs (2013). ‘Attention, I’m violating a maxim!’ A unifying account of the final rise. In Raquel Fernández and Amy Isard (eds), *Proceedings of the Seventeenth Workshop on the Semantics and Pragmatics of Dialogue (SemDial 17)*: 150–159.

Westera, Matthijs (in press). Rising declaratives of the Quality-suspending kind. To appear in *Glossa*.

Yip, Moira (2002). *Tone*. Cambridge: Cambridge University Press.

Zimmermann, Thomas E. (2000). Free Choice Disjunction and Epistemic Possibility. *Natural Language Semantics* 8: 255–290.