

# Intonation as a Constraint on Inferential Processing

*Thorstein Fretheim*

Department of Linguistics  
Norwegian University of Science and Technology, Norway  
thorstein.fretheim@hf.ntnu.no

## Abstract

The proper role of intonation in utterance interpretation should be assessed in terms of the way that intonation interacts with other linguistic phenomena, notably with syntactic form and with grammatically encoded meaning, whether conceptual meaning of a compositional nature or procedural meaning that constrains the way in which an addressee will perform deductive inferences over conceptual representations in a bid to recover the contextual effects that make the utterance relevant to her or him. The intonation of a given utterance facilitates the addressee's selection of the context (= set of activated assumptions) that constrains the relevance of the utterance in a way intended by the communicator. Direct coding of conventional meaning by means of intonation plays a rather marginal role in processes of utterance interpretation. This is particularly true of a prosodic system like that of Norwegian, the language providing the data to be discussed in this paper, because in Norwegian the speakers' intonational choices are severely restricted by the presence of a word-accent system.

## 1. Procedural meaning

In my opinion, saying, as Gussenhoven does in [1], that "Intonational meaning is located in two components of language, the phonetic implementation and the intonational grammar", gives a somewhat distorted picture of how we use intonation for a communicative purpose and how we as hearers avail ourselves of intonational clues in our bid to make sense of utterances directed to us. I am not disputing the fact that phonetic implementation severely constrains the means of conveying certain types of information in spoken discourse, which may also be responsible for some interesting cross-linguistic prosodic similarities, but I still think this should not and cannot be central in the study of how intonation affects our comprehension of utterances. As for the other claim, that meaning is located in the intonational grammars of languages, this is only true in a very indirect way, as most so-called 'intonational meaning' is heavily context-dependent. My claim is that such meaning is by and large not the result of encoding and decoding of linguistic material with a conventional semantic content but rather the direct result of context-driven (i.e. extra-linguistic) deductive reasoning that is only partly dependent on intonational triggers.

My position rests squarely on the tenets of Relevance theory, a cognitively based theory of communication which claims that the semantic representations that a hearer obtains by decoding the grammatically encoded meaning of a linguistic stimulus can never be equated with the meaning communicated by the speaker; the decoded linguistic

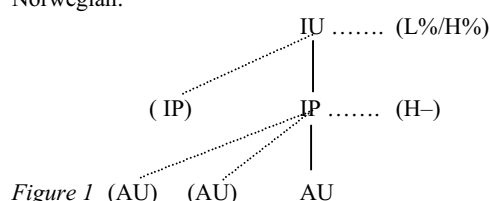
meaning is merely an input to the extra-linguistic thought processes without which utterance comprehension would be impossible.

According to Relevance theory [2] there are two ways in which linguistic meaning can act as input to the inferential processes involved in utterance comprehension. Linguistic expressions can encode concepts, the constituents of the conceptual representations that hearers have to manipulate in the inferential phase of the comprehension process in order to make sense of what is said. Some expressions, however, do not encode concepts but rather constraints on the way that the hearer's inferential computations should proceed, in other words, constraints on *how* to manipulate the concepts encoded by linguistic means, so that the stimulus yields as many contextual effects as possible for as little processing effort as possible, a state of 'optimal relevance' [2]. Procedural encoders in a language system are claimed to contribute to relevance by making a certain inferential path more manifest to the hearer, and by doing so in a cost-effective way.

Some linguistic devices have no conceptual meaning, nor do they encode a specific procedural instruction for the hearer to follow. Rather, they can be said to offer the hearer procedural information by virtue of their interaction with other kinds of linguistic devices in the utterance. A syntactic construction, or a specific linear order of syntactic elements, can provide procedural constraints without actually encoding them. Intonation – whether intonational phrasing or the choice of L% vs. H% boundary tone – provides procedural information in the sense described here, but it typically does so in conjunction with other types of procedural clues, like syntactic arrangements, or the speaker's choice of a particular function word whose procedural meaning is constrained further by some prosodic pattern. Provided there is an adequate match between intonational and syntactic form, the hearer will be able to compute the intended pragmatic implications of the cooccurrence of those two structurally very different types of procedural clues. The intonational component of the grammars of some languages may include certain prosodically defined 'constructions', some tunes that encode a specific meaning uniquely, e.g. some modal meaning, but the intonational system of other languages provides procedural information only in the sense that the interaction of intonation with other procedural devices of a structural or lexical sort help to select the right context and constrain the set of potential inferential computations at the hearer's end. Norwegian, the language from which the data to be discussed in this paper will be selected, is one such language. Due to its word-accent system, there are some very heavy constraints on the kind of tunes that can be produced for the purpose of directing the hearer to a certain inferential path that will make the utterance optimally relevant to him and thus serve as an important key to utterance interpretation.

## 2. Norwegian intonation

Norwegian Intonation Units (IUs) are made up of Accent Units, at least one and at most two of which end with a phrasal accent, H- (in East Norwegian). This H- terminates the immediate constituents of the IU, here referred to as an IP (which you may read as an acronym for either 'Intonational Phrase' or 'Intermediate Phrase', depending on your favourite model of intonational phonology). An AU is headed by an accented word form, which is either Accent I or Accent II, and prosodic phenomena of an intonational, as opposed to word-prosodic sort are largely confined to the right edge of AUs. The lexical Accent I (acute accent) in (East) Norwegian is L\*, and lexical Accent II (grave accent) is H\* followed by a post-lexical L serving as a point of division between the word-accentual H\* to its left and a phrase-accentual H- to the right. Figure 1 illustrates the hierarchy of intonational constituents in Norwegian:



There are some very strong similarities between Swedish and Norwegian intonation. The former is made familiar to students of utterance prosody all over the world, mainly thanks to the Lund model of intonation – [3] – in more recent years commonly referred to as the Swedish model of intonation. What was called a 'sentence accent' in [3] has later been re-labelled 'focal accent'. I prefer the by now fairly established term 'phrasal accent' (alternatively IP-accent) to 'focal accent', because not all F0 excursions associated with the so-called focal accent mark the information focus of the utterance, not in Swedish [4] and certainly not in Norwegian, e.g. [5]. [5] proposed a rule for the interpretation of 'bi-focal' intonation contours in East Norwegian. When an IU contains two IPs, the phrasal accent terminating one of them will contain new information, while the phrasal accent of the other IP is to be associated with information forming part of the context against which the new information should be validated. The IP which is meant to build up context for the hearer, or make certain contextual assumptions mutually more manifest, may or may not contain 'given' information in the qualified sense, that is, information assumed to be shared by speaker and hearer prior to the utterance. The important thing is that the speaker is presenting the information in one of the IPs as given, not whether the hearer is or is not able to recover it by a contextual search. There is no evidence that one of the two phrasal accents is 'stronger' than the other, not even when one of them aligns with linguistic material representing highly activated information; phonologically the phrasal accents in the first and the second IP are identical.

## 3. Constraints on information structure

A very important information-structuring device in spoken Norwegian is the expression of 'polarity focus' (the term may originally be due to [6]). Polarity focus consists in the speaker's using a given utterance to affirm or deny the truth of a proposition *P* activated in the immediately preceding discourse. The expression of polarity focus in a Norwegian

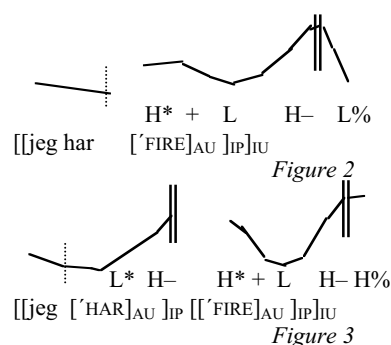
utterance involves a phrasal accent highlighting either a finite or an infinite verb form (or a predicative adjective) plus at least one word-accent in the complement of the highlighted predicate [7]. From an information-structural point of view this is neither broad focus nor topic-comment intonation with a highlighted topic constituent.

### 3.1. Broad focus vs. narrow focus on the sentence polarity

Consider the conversational exchanges between two Norwegian speakers A and B in (1) and (2).

- (1) A: Hvor mange gratisbilletter har du?  
'How many free tickets have you got?'  
B: Jeg har fire.  
'I have four.'
- (2) A: Har du fire gratisbilletter?  
'Have you got four free tickets?'  
B: Ja. Jeg har fire.  
'Yes. I have four.'

Figures 2 and 3 display two information-structurally distinct intonation patterns that speaker B in (1) and (2) can impose on the syntactic form consisting of a pronominal subject, a transitive verb, and a direct object. (IP boundaries are indicated by a vertical **||** in these contours, and the labelled bracketing is hopefully self-explanatory.)



Phonologically, broad focus requires a single IP that exhausts the IU, as shown in Figure 2. The procedural information conveyed by the intonational phrasing utilised there is that the final constituent with the phrasal accent on it carries new information, and any preceding constituents may or may not convey new information, depending on context. The assumption that speaker B might have four free tickets is not something that hearer A is supposed to be able to retrieve through a search in working memory or long-term memory; it is not presented by B as mutually manifest [2] to speaker and hearer. Therefore an utterance conforming to the intonation pattern displayed in Figure 2 is irrelevant as a response to A's question in dialogue (2), which is seen to activate the entity 'four free tickets' for B. That same intonation is suitable in the response to A's question in (1), however, because in (1) speaker A is requesting information about the number of free tickets in B's possession.

An answer to a yes/no question like A's question in dialogue (2) must present the entity 'four tickets' as discourse-activated (given) and the affirmative polarity of the sentence as new. Since a double-IP pattern implies recoverability of the information found in exactly one of the

two IPs, the structure of dialogue (2) shows that it will be acceptable for speaker B to furnish the verb with a phrasal accent H- for polarity focus there, and to give the second H- to its complement, the discourse-activated phrase *fire* ('four'), as in Figure 3. Alternatively the speaker could 'de-accent' *fire*, in the sense of failing to produce another H- in the IU.

Although it is not acceptable to use the broad-focus pattern of Figure 2 in a response to a yes/no question, an answer with a double-IP pattern of the type shown in Figure 3 would actually be in order even if the corresponding question were a wh-question of the type used by the first speaker in dialogue (1). What happens then is that the speaker is acting as if she were answering a slightly different question, one that she feels it would have been just as natural for the interlocutor to pose under the circumstances. Let us assume that speaker B in (1) knows that speaker A knows that four is the number of free tickets that B was supposed to receive. By choosing an intonation pattern which presents the expected number of tickets – four – as mutually shared information (Figure 3), B succeeds in building part of their shared context into her utterance. It is an intonation which serves to remind A of the number of tickets B should normally have received. Choosing the double-IP intonation of Figure 3, B causes A to associate the phrasal accent on the verb with narrow polarity focus and the phrasal accent on the cardinal with contextually recoverable information.

### 3.2. The effect of intonation on truth-conditional meaning

As noted earlier, polarity focus in spoken Norwegian is expressed by means of the combination of phrasal accent on a verb form and at least one word-accent later in the utterance. When the sentence is negated, polarity-focus intonation is a means of conveying the procedural information that the negation operator takes scope over everything else in the utterance. Thus a polarity-focus intonation placed on a Norwegian sentence like (3) will most naturally be taken to mean (3a), where the negation takes scope over the quantifier, while a broad-focus intonation will normally cause the hearer to draw inferences in accordance with the paraphrase (3b), where the quantifier takes scope over negation.

- (3) De jobba ikke hele uka.  
they worked not the.whole the.week  
(a) 'It is not the case that they worked all week.'  
(b) 'They were doing no work the whole week.'

Figure 4 displays a polarity-focus contour which should enable the hearer to select the interpretation that gives the negator wider scope than the universal quantifier *hele* ('the whole').

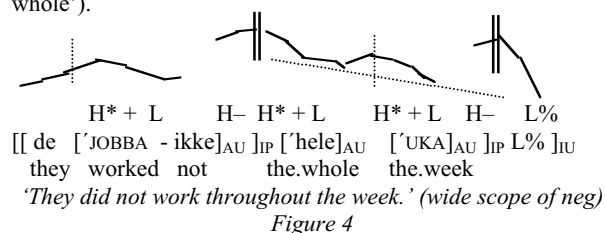


Figure 4

Although there is a phrasal accent on the sentence-final phrase *hele uka* as well, the earlier phrasal accent on the finite verb in Figure 4 is a sign that the focus is confined to the negative polarity of the sentence; the focus is the speaker's denial of the discourse-activated assumption that the people

referred to were working every day. The sentence-final phrase represents discourse-activated information but is not a topic phrase, because a topic takes scope over negation. That utterance-final phrase is rather a 'reported focus'. While an utterance of (3) produced with this intonation is most likely to be a denial of someone's (probably the interlocutor's) claim that the people referred to were working throughout the week, it would also be appropriate in a context where no explicit claim is rejected but where the speaker forestalls the interlocutor's forming an erroneous belief.

In contradistinction to the double-IP intonation of Figure 4, the broad-focus intonation of Figure 5 with a focused universally quantified phrase at the end causes the listener to identify the new information of the utterance as the speaker's specification of the duration of the period when the people referred to were not working. Thus the utterance type displayed in Figure 5 has an information structure which calls for the English translation in (3b) where the quantified phrase represents the focus of information. The utterance expresses a proposition which logically entails the proposition expressed by the denial represented in Figure 4.

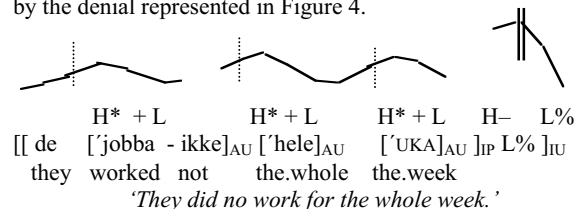


Figure 5

The intonational phrasing in Figure 5 is of the same type as in the shorter utterance whose contour was shown in Figure 1; a single IP exhausts the IU. This phrasing is consistent with a pragmatically inferred broad focus spanning the entire utterance, but also with a context in which it is already mutually manifest to the conversational partners that the truth-conditionally weaker proposition expressed by an utterance of Figure 4 is true, implying that the information focus is confined to the quantified phrase at the end of Figure 5.

One might be tempted to draw the conclusion that, since the universally quantified phrase in Figure 5 takes scope over negation, the speaker's placing that phrase in the preverbal sentence-initial position would give the hearer the procedural information he needs in order to construe a mental representation of the intended logical structure of the proposition expressed. But the initial position is the unmarked one for utterance topics and the quantified phrase should be presented in such a way that it can be easily picked out as the narrow focus of the utterance. What we find, in fact, is that the truth conditions of (4) are underdetermined by the syntactic form: (4) admits the same interpretations as (3).

- (4) Hele uka jobba de ikke.  
the.whole the.week worked they not  
(a) 'It is not the case that they worked all week.'  
(b) 'They were doing no work the whole week.'

The choice between two different intonational phrasings in a spoken utterance of (4) interacts with the syntactic form and constrains the relevance of the utterance by maximally constraining its truth-conditional content. It is not the syntactic structure of (4) with its grammatically encoded semantic representation which determines the truth conditions of an utterance of Figure 6; nor is the difference in truth-

conditional meaning determined by the intonation pattern, of course. What happens is that the interplay of syntax and intonation provides the hearer with a procedural clue which hopefully enables him to recognise the communicated proposition by means of pragmatic inference. It is the hearer's inferentially determined linking of the discontinuous items *hele uka* ('the whole week') and *ikke* ('not') that causes him to construe the quantified phrase as the scope of negation here ('They were working, but *not throughout the week*').

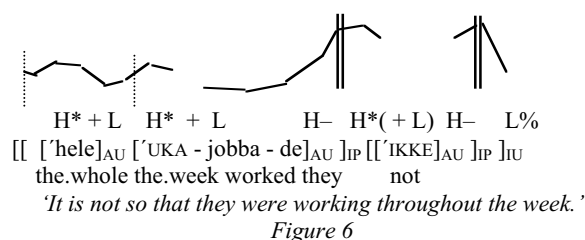


Figure 6

A number of languages with a dynamic stress system utilise a similar type of prosodic highlighting of the intended scope of negation when the negator and its scope are discontinuous and their order of presentation does not adhere to the unmarked 'iconic' principle whereby relatively wider scope correlates with a relatively earlier position in the utterance. The highlighting of both the negation operator *ikke* and the quantified phrase, and the de-accenting of the verb *jobba* ('worked') compensates for the marked position of the negator to the right of its scope in Figure 6.

Observe that it is not so that the combination of syntactic and prosodic form in Figure 6 *encodes* a propositional form that places the quantified phrase within the scope of negation. Rather, this mapping of syntax and intonation will have consequences for the hearer's inference-based search for the proposition expressed and will in most cases help to narrow down the set of candidate propositions to a single one. The pragmatic effect of the speaker's placement of one phrasal accent on the negator and one on the preposed phrase *hele uka* could possibly be explained in terms of what Gussenhoven [1] calls the 'effort code'. It would be a mistake to try to account for it in terms of language-specific rules or conventions.

An utterance of the Norwegian sentence in (5), produced with an intonation similar to what was seen in Figure 6, will not be comprehended as a denial of the assumption that the people had been working every day.

- (5) Hele den uka, da jobba de ikke.  
the.whole the.week then worked they not  
'All that week they didn't work.'  
[[['hele']\_AU den ['UKA']\_AU ]IP ]IU  
[[['DA-jobba-de']\_AU ]IP [['IKKE']\_AU ]IP ]IU

The phrase-accentual pattern from Figure 6 is no guarantee that the negation operator will be understood as taking the wider scope. Syntactically the quantified phrase in (5) is dislocated to the left of the clause proper and is represented by an anaphoric copy, *then*, inside the clause. This construction encodes the procedural information that the entity referred to by the dislocated phrase is to be construed as the topic of the utterance, a discourse-activated topic which takes scope over the negation. (I decided to add the demonstrative determiner *den* ('that') here to make this topic-focus structure pragmatically more acceptable; due to this extrametrical demonstrative there is now a reference to one

specific week. However, even with the original form *hele uka* ('all week') from example (4) the quantified phrase would be processed as falling outside the scope of negation.)

Except for the fact that the phrase-accented *da* ('then') is an anaphoric copy of the quantified phrase in the intonational notation in (5), the syntactic-prosodic form of the second IU in (5) is exactly as in Figure 6. Even if there had been no dislocated nominal, the anaphor *da* encodes an instruction to associate the referent of *da* with an entity that takes scope over negation (internal negation). No intonation pattern can overturn this procedural meaning.

If our Norwegian speaker keeps the syntactic structure of her utterance exactly as in (4)/Figure 6, she can choose to pronounce the utterance with an intonation that makes the internal negation indicated in (5) a lot more accessible than the external negation of Figure 6. And if the internal negation reading is made more accessible due to the linguistic form of the utterance and is moreover consistent with the hearer's full set of context-dependent beliefs about the communicative intention of the speaker, then the Principle of Relevance [2] will direct the hearer to that interpretation, because it yields an adequate number of cognitive effects *for the least processing effort*. Again, accessing the interpretation of the quantified phrase as a topic outside the scope of negation is arguably made even easier by the appearance of the determiner *den* ('that') that was added in (5); nevertheless the intonational phrasing represented in (6) directs the hearer to the internal negation interpretation even in the absence of *den*.

- (6) [[['hele']\_AU ['UKA']\_AU ]IP [['JOBBA-de-ikke']\_AU ]IP ]IU  
'All week they didn't work.'

(6), and the corresponding intonation contour in Figure 7, exemplifies the prototypical topic-focus structure in which the topic (in the first IP) precedes the focus (in the second IP).

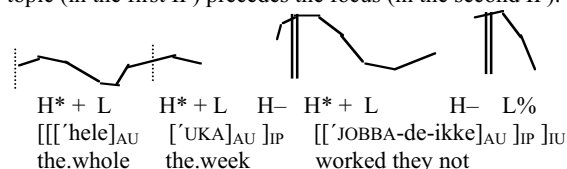


Figure 7

While the negator was highlighted by a phrasal accent in Figure 6, the negator is unaccented and the phrasal accent is shifted to the finite verb *jobba* ('worked') in Figure 7. I would like to remind the reader that the phrasal accent on the finite verb in Figure 7 does not represent polarity focus, because as noted at the beginning of section 3, a phrasal accent on a finite verb must be followed by at least one word-accent later in the utterance in order to be interpreted as polarity focus. The focus in Figure 7 is rather on the open proposition 'They did not work', which is temporally constrained by the quantification over weekdays in the preceding IP.

We have established that there is a truth-conditional difference between an utterance conforming to Figure 6 and an utterance conforming to Figure 7, and we observe that the only linguistic difference between the two utterance types is in the intonation patterns. Still I must again warn against the conclusion that what we understand to be a truth-conditional difference between the respective utterance types in Figure 6 and Figure 7 *depends on* the intonation. The information structure of these two utterance depends on the set of inferences that the hearer draws from the stimulus, and that

set is admittedly constrained by the combination of syntactic and intonational form. The initial position of the quantified phrase will be associated with the topic of the utterance, unless that interpretation is contradicted by procedural information to the contrary. Such contrary information is available in Figure 6 where the phrasal accent on the utterance-final negator *ikke* links that element to the other phrase-accented element, the utterance-initial quantified phrase, causing the hearer to test for relevance the outcome of following an inferential path that leads to external negation, and to do so before any alternative processing has been given a chance to be tested. Thus Figure 6 and Figure 7 differ in that they are likely to activate different inferences about the intended information structures of the two utterance types, and identifying the information structure is a key to recovering the proposition. While Figure 7 is a typical topic–focus structure where the topic is manifested in the first, and the focus in the second IP, the utterance-initial quantified phrase in Figure 6 is not a topic but rather what I previously referred to as the reported focus of an utterance containing the interlocutor’s expressed belief, a belief that is rejected when someone uses the intonation of Figure 7. In spite of some obvious surface differences both in syntax and intonation, the information structures of the utterance types in Figure 4 and Figure 6 are virtually identical, and their truth-conditional meaning is the same (external negation). Likewise, the utterances types in Figure 5 and Figure 7 point to the same truth-conditional meaning (internal negation), but for this particular pair their information structures differ, even though the proposition expressed is the same. The quantified phrase meaning ‘all week’ is the information focus of an utterance of Figure 5, but it is the topic of an utterance of Figure 7.

#### 4. The boundary tones L% and H%

An overview of how intonation contributes to relevance in Norwegian speech would not be complete without a section on the meanings of boundary tones. Intonational phenomena in East Norwegian are to a large extent limited to what happens at the end of AUs. Any perceived falling tune in an accented syllable is either an automatic transition from a phrase-accentual H– to a L\* for Accent I or a transition from H\* for Accent II to the L point of division between the word-prosodic and intonational part of an Accent II AU. Understandably, the successful production of a minimal opposition between a final L% and H% in otherwise prosodically identical utterances can be quite a challenge if everything has to happen within the rigorous confines of the East Norwegian AU and IP.

Due to the fact that the East Norwegian phrasal accent is a H– at the end of a rising tune, and that the utterance-final boundary tone – L% vs. H% – is regularly realised in the same syllable as the H–, one may wonder how the East Norwegian listener is able to perceive whether a given utterance ends in a L% or a H%. It is not even clear to the present author that the boundary tone is an obligatory ingredient of a phonologically well-formed East Norwegian IU. However, there are certain syntactic constructions in which the paradigmatic contrast between a perceived L% and a perceived H% has to be recognised and paid proper attention to in the comprehension process; otherwise the utterance will be misunderstood. Norwegian has a series of modal and evidential particles which appear either in the position right after the finite verb or in a right-detached position following the clause structure. The contextually inferred meaning of

those particles is constrained by the speaker’s choice between a clause-internal and a clause-external (right-detached) position, and the inferred meaning of a particle in the latter position is further constrained by the boundary tone of the IU.

One interesting property of Norwegian particles is that those which may appear in the utterance-final position are lexically specified for the type of boundary tone they license in that position. For example, the Norwegian particle *da* (‘then’) is an inference marker when it is right-detached. It indicates that the proposition expressed in the clause to which it is adjoined (the ‘host’) is the speaker’s representation of a thought she attributes to the hearer, a thought derived from pragmatic processing of the hearer’s most recent utterance. The speaker uses *da* to elicit the hearer’s confirmation of the inference she has drawn about the hearer’s thoughts. While a declarative host is only compatible with a *da*-L%, an interrogative host gives the speaker a communicatively relevant choice between L% and H%. When the right-detached *da* after an interrogative is realised as *da*-L%, the boundary tone L% provides the information that the speaker is prepared to update her total set of assumptions about the world by adding to it the proposition expressed in the (interrogative) host, provided the hearer confirms that the speaker’s inference is correct. The contrasting boundary tone H%, however, instructs the hearer to conceive of the proposition expressed in the interrogative host as one that contradicts the speaker’s current set of beliefs, and which she is not prepared to accept as true unless the hearer succeeds in convincing her of its truth. These are language-specific facts whose relation to ‘biological codes’ must be very indirect indeed.

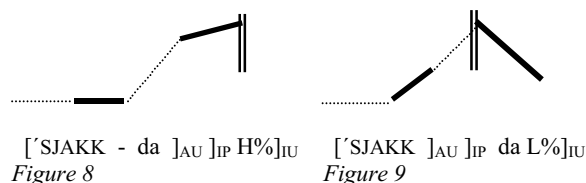
[8] is a report on an experimental study of how hearers exploit the procedural information encoded by a *da*-L% compared to a *da*-H% attached to interrogatives. In one of the tests reported on, the communicative setting is as follows: speaker A announces, in the presence of B, that she is now going to sit down and finish reading the last few pages of a book she has been reading for some time. B reacts to this information by asking A if she has forgotten that she had agreed to play chess with him. A then produces an utterance whose propositional content depends on how one understands the preceding utterance produced by B. Even though the test subjects were asked to react to A’s final utterance and respond according to what they felt that that utterance meant, the real stimulus utterance whose prosody was varied systematically was the preceding question performed by B, an interrogative with a right-detached particle *da*. We wished to ascertain whether the listeners judged the boundary tone on that particle to be H% or L%. Their processing of the next-to-final utterance produced by B, notably their identification of *da* as either *da*-H% or *da*-L%, provides them with a piece of contextual information without which they would be unable to identify the linguistically underdetermined propositional form of the last utterance produced by A, especially the antecedent proposition binding the anaphor *det* in A’s response:

- (7) B: Skal vi ikke spille sjakk da?  
‘Aren’t we going to play chess [then]?’  
A: Det har ikke jeg sagt.  
that have not I said  
‘I haven’t said that.’

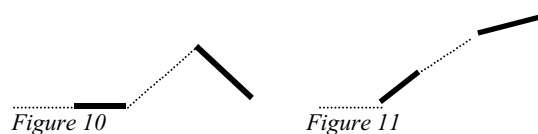
The test subjects were asked to determine whether A’s utterance meant (i) ‘I have not said *that I am going to play chess with you*’ or (ii) ‘I have not said *that I am not going to*

play chess with you', that is, whether the referent of the demonstrative *det* ('that') was intended to be a positive proposition or its contradictory negative counterpart. The hypothesis was that a perceived *da*-L% would make B's question sound like a request for confirmation of the negative proposition 'We are not going to play chess' representing B's inference (after B was informed that A would now sit down and finish reading a book), while a perceived *da*-H% would make the speech act sound more like a challenge: B is presenting the negative proposition as an interpretation of a thought attributed to his interlocutor A and is dissociating himself from it. Thus A's response to B's question could be either a denial of the thought expressed by B that A is presumably not going to stand by her promise to play chess with him, or a denial of the thought that there ever existed such a deal between them. *Da*-L% would set up a context that supported the former interpretation and reading (ii) cited above, while *da*-H% would set up a context that supported the latter interpretation and the alternative reading (i).

Some of the more interesting intonational contrasts that the test subjects encountered are seen in Figure 8-11 below, whose stylised F0 contours of the sequence *sjakk da* ('chess then') represent four of the stimuli. In Figure 8 the low-pitched vowel [a] of the otherwise unvoiced word *sjakk* is followed by a high-pitched particle [da], both of which are indicated as solid lines. Figure 9 on the other hand shows a rise in the accented syllable *sjakk* and a fall in the subsequent unaccented syllable *da*. The double vertical line indicates the end of the IP, manifesting the phrasal accent that gives prominence to the accented nominal *sjakk*. The low, even pitch of the accented syllable in Figure 8 is typical of bisyllabic AUs in East Norwegian, while the steep rise in the corresponding syllable in Figure 9 is typical of an IP-final monosyllabic AU.



The outcome of the test reported on in [8] warranted the conclusion that the speaker's prosodic handling of the penultimate syllable *sjakk* contributed just as much to boundary tone identification as the handling of the final syllable where the pitch was either high as in Figures 8 and 11, or falling to low as in Figures 9 and 10. The pattern in Figure 8 led to a very consistent reference resolution in favour of the paraphrase in (ii) above (hence L%) and the pattern in Figure 9 led to an equally consistent resolution in favour of paraphrase (i) (hence H%). Figure 10 and 11, however, gave the listeners conflicting perceptual cues which impeded identification of the boundary tone and consequently made it hard to resolve the reference of the pronoun *det* in A's utterance in (7).



What happens in Figure 9 is that the inference particle *da* is placed outside the AU and IP (made extrametrical), which allows the speaker to produce a syllable which is perceived as falling from beginning to start. This pattern presupposes a

monosyllabic AU in Figure 9 contrasting with the bisyllabic AU for the H% pattern in Figure 8. Thus the low, even tone on *sjakk* in Figure 8 is a predictor of *da*-H%, while the rise on *sjakk* in Figure 9 is a predictor of *da*-L%. The procedural information derivable from the handling of the penultimate syllable of the IU is contradicted by the handling of the final syllable in Figures 10 and 11, resulting in irrelevant stimuli.

## 5. Conclusion

Spoken Norwegian does not exploit all those tonal distinctions that are often taken for granted in literature on universal meanings of highs and lows in a F0 contour. East Norwegian intonational phonology gives the speaker no freedom to combine tones to create complex tones for an intonational purpose, nor is it possible to choose between a fall and a rise in a monosyllabic AU. The semantic and pragmatic significance of peaks and troughs in the F0 contours of natural language utterances should not be determined on the basis of hypotheses about universal meanings associated with the syntagmatic variation between Hs and Ls. Until we know a lot more about language-specific constraints on intonational form we should in my opinion refrain from making very bold predictions about the universality of form-meaning correspondences in our research on the role of intonation in utterance interpretation. Linguistically determined form-meaning mappings in the area of intonation are few and far between, at least in a language like Norwegian. At most, what you can expect intonation to do is to provide the hearer with some guidelines as to how the inferential comprehension work should proceed, and most of the time such guidelines are not due to some inherent meaning of an intonation pattern but rather to the way that intonation interacts with linguistic devices belonging to other components of the grammar.

## 6. References

- [1] Gussenhoven, C., this volume. Intonation and interpretation: phonetics and phonology.
- [2] Sperber, D.; Wilson, D., 1995. *Relevance: Communication and Cognition*, 2<sup>nd</sup> edition. Oxford: Blackwell.
- [3] Bruce, G.; Gårding, E., 1978. A prosodic typology for Swedish dialects. In *Nordic Prosody: Papers from a symposium*, E. Gårding; G. Bruce; R. Bannert (eds.). Department of Linguistics: Lund University, 219-228.
- [4] Hansson, P., 2001. The effect of individual words' information status on accentuation. In *Nordic Prosody: Proceedings of the VIIIth Conference*, W.A. van Dommelen; T. Fretheim (eds.). Frankfurt am Main: Peter Lang, 89-102.
- [5] Fretheim, T., 1987. Pragmatics and intonation. In *The Pragmatic Perspective*, J. Verschueren; M. Bertuccelli-Papi (eds.). Amsterdam: John Benjamins, 395-420.
- [6] Gussenhoven, C., 1984. *On the Grammar and Semantics of Sentence Accents*. Dordrecht: Foris.
- [7] Fretheim, T.; Nilsen, R.A., 1993. The Norwegian broad-focus avoidance strategy. In *Nordic Prosody VI*, B. Granström; L. Nord (eds.). Stockholm: Almqvist & Wiksell, 49-64.
- [8] van Dommelen, W.A.; Fretheim, T.; Nilsen, R.A., 1998. The perception of boundary tone in East Norwegian. In *Nordic Prosody: Proceedings of the VIIIth Conference*, S. Werner (ed.). Frankfurt am Main: Peter Lang, 73-89.