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Indian Languages as Intonational 'Phrase Languages'[1]

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1. Intonation in grammar

Intonation has numerous facets. It reflects emotions and interests, it helps to identify speakers in society, and crucially for linguists, it plays an important role in grammar. This paper will not be concerned with what has been called 'the metalinguistic aspects of intonation,' as for instance, the increase in pitch range when we want to add emphasis to what we say. Also biological aspects, like the 'frequency code' (Ohala 1983) and the 'effort code' (Gussenhoven 2004), are not a primary concern of this paper. The biological codes express that some uses of fundamental frequency (F_0) are genetically and ontologically anchored. For instance, children have a higher pitch than both men and women, due to their shorter vocal folds. Tentative universal (cross-species) interpretations of this physiological fact have been provided in the literature as 'submissiveness' vs. 'dominance,' among other peculiarities like 'friendliness' vs. 'aggression.' However, biologists have taught us to be cautious with ready-made explanations in evolution, and research on pitch in birds shows us that higher pitch can have completely different motivations than social roles. In rain forests, birds living in the canopy sing with higher pitch than birds foraging on the ground because higher sounds travel better in higher altitudes (Morton 1975). Closer to the linguistic concerns of the present paper, it has been observed that tonal contours as social conventions are culturally and socially meaningful. Ladd (1996) gives striking examples of different interpretations of tonal contours in different varieties of English. For instance, a question with a rise-fall intonation is felt as neutral in British

English, but sounds condescending in American English. And, also for English, Gunlogson (2001) shows that a question with a declarative syntax like (1a) differs from its true declarative counterpart in (1b) only in terms of tonal contour. The question is rising and the statement is falling.

(1) a. It's raining?
b. It's raining.

The syntactic fact that the verb occupies the second position in the sentence constitutes the declarative part. It expresses in both cases commitment to the propositional content of the sentence (in contrast to a syntactic question, which does not have this effect). The part played by intonation, that is, the rising contour in the question in (1a), is responsible for attribution of the commitment to the Addressee. In using (1a), the Speaker commits the Addressee to the fact that s/he knows whether it is raining and fails to commit him or herself to the content of the sentence. In this respect, rising declaratives are like interrogatives. A true declarative like (1b), by contrast, commits the Speaker to its content. Rising declaratives cannot be used 'out of the blue.' A question like (2a) is felicitous if the Speaker has no idea of the fruit being eaten by the Addressee, but (2b) is not well-formed in this context.

(2) a. Is that a persimmon?
b. That's a persimmon?

Because of such (and other) constraints on the use of intonational patterns, it appears important to elaborate precise intonational grammars. Intonation is now classically studied with the help of autosegmental-metrical (AM) representations, a model with its origin in the work of Bruce (1977) and Pierrehumbert (1980). A sentence melody is analyzed as a sequence of tones and the association between tune and text proceeds according to certain rules. In this conception, tones are targets which the speaker's voice seeks to attain. The fundamental frequency defining the melody interpolates between the tonal targets, and produces tunes of smoothly decreasing or increasing frequency, or tonal plateaus between two tones. In Pierrehumbert's model for English, tonal targets are of three kinds. First, some tones seek to associate with prominent syllables. These tones are provided with a star and can be mono- or bitonal (H*, H*L, L*, etc.). The second kind of tones are boundary tones, which associate with edges of prosodic domains (H%, L% in some transcriptions). The third kind of tones are phrase tones, which define melodies between the last pitch accent and the final boundary tone (H^-, L^-). Pierrehumbert & Beckman (1988) have shown that these last tones are better understood as boundary tones of smaller prosodic domains. In the analysis of Indian languages proposed below,

only pitch accents and boundary tones will be used. The phrase and boundary tones are subscripted for their domains, and are written H_I, H_P, L_I, etc.

2. Typology of intonation systems

In trying to locate Indian languages in existing typologies of intonation, it becomes conspicuous that these languages present properties which render them different from the usual classes. Traditionally, languages have been divided on the basis of their word melodies (Gussenhoven 2004, Hyman 2006, Jun 2005, Ladd 1996). Languages are then divided into classes according to whether they have a stress, a tone or a pitch accent on a designated syllable of each lexical item. This leads to a typology of the kind shown in (3). The first category (3a) consists of languages in which each word has a syllable specified for lexical stress, but the tonal realization of this stress is free. (3b) groups languages which have lexical stress, as in (3a), at least in part of their vocabulary, but additionally, this stress must be tonally realized in a certain way. Thus not only the position of the stress is specified but also the pitch accent coming with the stress. Tone languages in (3c) specify tonally all or nearly all syllables, not only the accented or stressed ones. There is no freedom as far as intonation is concerned, at least at the level of the word. And the last category (3d) contains languages in which words have no lexical stress and also no tonal specification. In the languages of the last category, it is of course the case that words have tones realized on them, but the claim here is that these tones do not occur at the level of the word, but only at the level of the prosodic phrase (called p-phrase in this paper).

(3) **Word-level accents and tones**
   a. Main accent without tonal specification: English, Italian
   b. Main accent with tone specification: Swedish, Japanese
   c. Tone specification on (every) syllable: Yoruba, Cantonese
   d. No lexical accent, no tone specification: Bengali, French, Malayalam

The typology on which this paper is based does not use word melodies as primary, but rather focuses on sentence melodies. It is assumed that word melodies as shown in (3) are only one of the components entering a classification of languages, the other being sentence melodies, coming from phrase tones. In other words, languages are classified not only according to the kind of tonal structure that the words have, but also according to the tonal pattern associated with the sentences. From this perspective, languages can be classified according to (4). The first class of languages, intonation languages in (4a), display

a rich array of pragmatically triggered phrasal tones. Sentence melodies change according to the kind of pragmatic meaning they convey. English, Italian and German are languages of this type, but also French, which is a language without lexical stress. Swedish, a language which tonally specifies lexical accents, also has a free intonation at the level of the sentence. Second, tone languages in (4b) are pretty much constrained by the lexical tones and do not show a lot of intonational variation for the sake of pragmatic meaning. And third, the intonation of some languages comes exclusively from phrasal tones, that is, tones assigned at the level of intonational phrases. This is the group of phrase languages, to which Indian languages belong.

(4) Phrase-level tones
   a. Intonation languages: Rich array of pragmatically triggered phrasal tones on top of pitch accent
   b. Tone languages: Nearly no phrasal tones (correlating with rich lexical specification of tone)
   c. Phrase languages: Only phrasal tones (no pitch accent, no lexical tone)

3. Intonation of Indian languages

The similarity in intonational patterns of several Indian languages is striking, and in the remainder of this paper, I will sketch out the formal aspects of prosodic structure and tones which conspire to produce it. Two aspects of intonation will be particularly highlighted: first, the prosodic and tonal structure of declarative sentences, both in canonical and in marked word orders; second, the effect of focus, givenness and topic on the prosodic and tonal structure. As for the languages that are studied, we will look at two language families displaying the similarities. First, the intonation of Indo-Aryan Hindi is summed up and compared to Bengali, and in a second step the Dravidian languages Tamil and Malayalam are shown to have a similar intonation.[2]

3.1 Hindi

Good descriptions of Hindi intonation appear in Harnsberger (1994, 1999), Moore (1965) and Dyrud (2001), among others. The work of Nair (2001) and Dyrud (2001) suggests that Hindi has lexical stress, in the sense that every word has a designated syllable on which prominence is realized (but see Hayes 1995 and Moore 1965, who notice contradictions in the older literature). Both Nair (1999) and Dyrud (2001) find acoustic correlates of prominent syllables, like higher pitch and longer duration. The position of lexical stress is dependent on syllable weight, the heavier syllables attracting stress first (see Hussain 1997,

who shows how the position of stress can be predicted by syllable weight). However, the assimilation of these correlates to the kind of pitch accents found in English is problematic. First, there is no necessity for a syllable to carry them. Second, speakers have no intuition about lexical stress, or the intuitions are inconsistent. The very fact that it is so difficult to pin down pitch accents speaks against their existence. Third, the tonal excursions are realized with a tonal pattern which does not resemble the kind of pitch accent found in intonation languages. The most striking difference is that the direction of the tonal excursion is always the same, but its exact position in the word is not. I argue here that the rising contour at the beginning of words is not triggered by pitch accent, but by phrasal tones.

All researchers of Hindi intonation agree that each content word except the final one is associated with a rising contour. The domain for this rise has a morpho-syntactic base, but is phonologically defined as a prosodic phrase, abbreviated as p-phrase. Harnsberger (1994) proposes that the low part of the rising contour is a low pitch accent, annotated as L* in the AM notation system. He presents an alternative analysis for the high part of the rising contour: it is either a trailing tone, thus the second part of a bitonal rising tone (L*H), or a boundary tone, in this case H_P. The subscript 'P' represents a boundary at the level of the p-phrase (see Hayes and Lahiri 1991 for this annotation convention). In the analysis proposed here, the low part of the rising tone is a low phrasal tone L_P and the high part of the rising tone is neither a trailing tone nor a boundary tone in the traditional sense, but also a phrasal tone, located after the L_P tone, but not obligatorily aligned with the end of the p-phrase. Between the initial L_P and the final H_P, interpolation is usually found, meaning that the voice of the speaker smoothly rises between the two tones in the course of the p-phrase.

Only two levels of prosodic phrasing are used in this paper, called prosodic phrases (p-phrases) and intonation phrases (i-phrases).[3] The i-phrase is the highest level of phrasing considered in this work. It includes a whole sentence, very often several p-phrases, and does not have the same tonal correlates as a p-phrase. The end of an i-phrase often has different tonal correlates from that of a p-phrase, because of finality. Another important difference between i-phrase and p-phrase is to be found at the beginning of an i-phrase. In this position, pitch is reset. These higher prosodic domains are primarily mapped to the syntactic structure, but in some languages, focus can have an influence on prosodic phrasing, as well, as has been shown by Kanerva (1990) for Chichewa. We will not show how the syntactic structure defines prosodic phrases, since this would lead us too far away from our subject,

and the interested reader is referred to the relevant literature (Selkirk 1986, 1995, Nespor & Vogel 1986, as well as and many others). We assume that both p-phrases and i-phrases are recursive. The term p-phrase is used here for prosodic units roughly corresponding to maximal projections or lower domains, and i-phrases roughly correspond to whole sentences or higher domains. An example of the kind of phrasing used here appears in (5).

(5) $[[\text{Ms. Benwell}]_P\ [[[\text{always}]_P\ [\text{buys thyme}]_P]_P\ [\text{at the market}]_P]_P]_I$

In many languages, information structural changes affect prosody, as has been shown for intonation languages (see for instance Féry & Kügler 2008 for a quantification of these effects in German), and it may be asked whether the same takes place in Hindi. Hindi is a head-final (SOV) language, with relatively free word order. Constituents may be scrambled to express different information structural configurations. Focused constituents typically occupy the immediately preverbal position. 'Focus' is understood, rather traditionally, as the part of the sentence which introduces alternatives (Rooth 1985, 1992). In the general case, an all-new sentence does not trigger a set of alternatives, although the possibility of focusing a whole sentence cannot be excluded in principle.

Focus has been claimed in the literature to have three prosodic effects in Hindi (see Harnsberger 1994, 1999, Moore 1965, Dyrud 2001, among others). First, the rising pitch pattern may be 'hyper-articulated' and show a higher excursion, a greater intensity and longer duration. Second, after the focused element, a phrase break may occur. According to Moore (1965), focus has a phrasing effect, as it inserts a prosodic boundary after the focused word, and separates it in this way from the remainder of the sentence. Third, postfocally, the pitch range may be compressed or even completely flat and deaccented (Harnsberger and Judge 1996), although rising pitch accents are still realized in the compressed pitch range.

In a production experiment bearing on the prosodic realization of focus in Hindi, Patil et al. (2008) have analyzed sentences spoken by 20 native speakers, in two word orders (SOV, the canonical word order, or OSV) and three focus contexts (subject focus, object focus or wide focus ('all-new' sentences)). Measurements of F_0 range, F_0 maximum and duration were performed on all sentences (1200 altogether).

Examples of the sentences included in the experiment are given in (6) and (7), with the prosodic phrasing and the tonal pattern (my analysis). A pitch track of this sentence in SOV order and in an all-new context appears in Fig.1. All pitch tracks are made with Praat (Boersma & Weenink 2005).

(6) SOV: L_P H_P L_P H_P H_P L_I
[[*adhyaapak ne*$_F$]$_P$ [moorti ko]$_P$ [banaayaa]$_P$]$_I$
teacher ERG sculpture ACC make-PAST
'The teacher made the sculpture.'

(7) OSV: L_P H_P L_P H_P H_P L_I
[[moorti ko]$_P$ [*adhyaapak ne*$_F$]$_P$ [banaayaa]$_P$]$_I$
sculpture ACC teacher ERG make-PAST

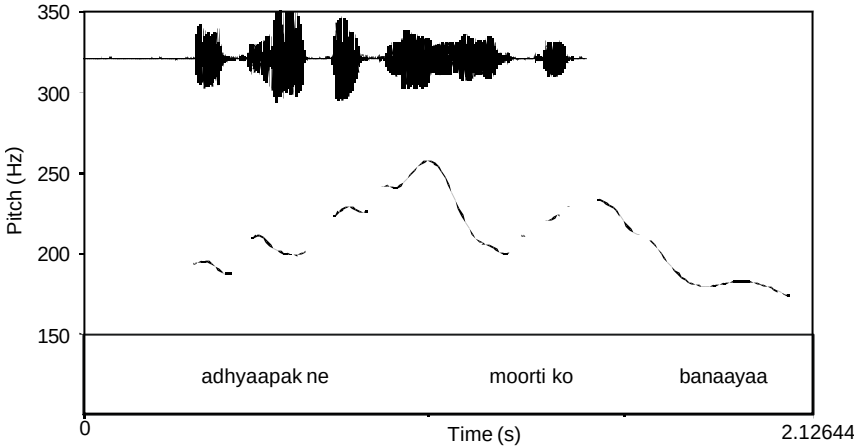

Figure 1. *Illustration of a declarative Hindi sentence*

The averaged measurements of the F_0 pattern and of the duration, of all speakers and all sentences, delivered the following results:

- The tonal and prosodic representation in (6) and (7) and Fig.1 stands for all three focus structures and both word orders. Subject and object had a rising contour, and the final verb a falling one. A downstep pattern was realized in all conditions. The high tone on the first constituent (subject or object) was always higher than the high tone on the second constituent (object or subject), and the high tone on the verb was always the lowest. In all three focus structures and in both word orders, the prosodic and tonal structure remained unchanged.

- When focus was medial, as in (7), there was no change in the relationship of high tones as compared to the all-new pattern. There was no raising of the focused constituent, and no lowering of the given constituent. This result holds true for both word orders.

- When focus was initial, the focused constituent was raised relative to the all-new pattern, and the postfocal constituent was lowered. However the change in the melody was restricted to the quantity of downstep. There was no change in the overall tonal contour. The high tone on the focus was slightly higher than in the other two focus

conditions, and, most importantly, all following postfocal tones were significantly lower, not only the high tones, but the low ones, as well. But there was no complete compression of the pitch range, as is observed in English or German in postnuclear regions. In other words, initial focus induces a postfocal reduction of the pitch range. However, the downstep relationship between the three high tones remains, as well as the basic prosodic and tonal structures. It must be added that not all speakers, and not in all instances, realized a higher initial focus followed by a compression of the postfocal domain. These strategies seem to be optional in Hindi.

- Duration of the initial focused constituent was also slightly longer.

- As for the effect of word order, SOV and OSV contours were very similar. The F_0 range on the initial constituent shows a small but significant effect of word order, though the F_0 maximum was not significantly higher in OSV than in SOV. Additionally, the duration of the preverbal constituent was significantly longer in OSV as compared to SOV. This is true for all focus conditions.

Summing up the results for Hindi declarative intonation, focus and givenness seem to only have a minimal effect on the prosodic and tonal structure. The only conspicuous result was raising of an initial focused constituent, as well as postfocal range reduction, and a small increase in the duration of initial focused constituents.

In phrase languages, the tonal structure of utterances is not changed much as an effect of information structure. This kind of pragmatic meaning is expressed by morpho-syntactic variation rather than by local prosody, as is common in intonation languages.[4]

3.2 Bengali

In this section, it is proposed that Bengali should be re-analyzed as a phrase language, rather than as an intonation language with pitch accent.

The intonation of Bengali has been described extensively by Hayes & Lahiri (1991). See also Fitzpatrick-Cole (1996), Fitzpatrick-Cole & Lahiri (1997), Lahiri & Fitzpatrick-Cole (1999), Selkirk (2006) and Truckenbrodt (2003) for further discussions of different aspects of Bengali intonation. Hayes & Lahiri's seminal paper fulfills two tasks: first, they present different 'tunes' relevant for the expression of pragmatic meanings and second, they introduce rules for the formation of p-phrases. It is conspicuous that, except for the focus tone, nearly only boundary tones can change for the sake of pragmatic meanings. Intonation patterns described by Hayes & Lahiri that we will not comment on any further comprise among others the yes/no questions

($L^*H_IL_I$) and the offering nucleus (L^*H_I), as well as patterns with continuation rise, like the declarative nucleus ($H^*L_PH_I$).

Like Hindi, Bengali is a head-final language (SOV), and the formation of p-phrases is primarily based on syntax. Every maximal constituent is a p-phrase, and the verb often forms its own p-phrase, obligatorily so when it is focused. Evidence for p-phrases comes not only from the tonal structure, but also from segmental processes like /r/ assimilation and voicing assimilation, which only take place inside of p-phrases. The absence of these processes correlates with p-phrase boundaries. Some variations in phrasing occur as a consequence of speed, style and givenness, but these variations are also subject to syntactic constraints. It is not the case that all kinds of restructuring are allowed. Hayes & Lahiri also show that the phrase construction rule is cyclic and recursive. A small constituent embedded into a larger one can form its own p-phrase, but can also be part of the larger one. The examples in (8) and (9), from Hayes & Lahiri (p.85), show some variation in the formation of p-phrases in sentences in the form of recursion. Prosodic constituents can be phrased together under the influence of rhythm and information structure, as in (8a-d), which show possible phrasings of this sentence; however the verb, which has the tonal structure of a focused phrase, and is thus the focused constituent of the sentence, must be phrased separately (8e).[5] In this case, restructuring is triggered by givenness, but it can also apply in rapid speech. According to Aditi Lahiri (p.c.), the original phrasing is not completely lost, so that the structure seen in (8a) is part of the other ones, though the internal p-phrases are no longer as clearly defined tonally.

(8) a. (ámor)$_P$ (čador)$_P$ (tara-ke)$_P$ (dieč^{h}e)$_P$
b. (ámor čador)$_P$ (tara-ke)$_P$ (dieč^{h}e)$_P$
c. (ámor)$_P$ (čador (tara-ke)$_P$(dieč^{h}e)$_P$
d. (ámor čador (tara-ke)$_P$(dieč^{h}e)$_P$
e. *(ámor)$_P$ (čador)$_P$ (tara-ke (dieč^{h}e)$_P$
(Amor (scarf (Tara-OBJ (gave
'Amor gave the scarf to Tara.'

(9) shows that a complex predicate forms a single p-phrase, while with the same sequence of words used literally, as an object-verb sequence, the words are phrased separately. Again, phrasing is taken from Hayes & Lahiri (1991:90). In (9b) the verb is phrased separately.

(9) a. ((aami)$_P$ (b^{h}út dek^{h}lam)$_P$)$_I$
I ghost-saw (I was startled)
b. ((aami)$_P$ (b^{h}út)$_P$ (dek^{h}lam)$_P$)$_I$
I ghost saw (I saw a ghost)

In an all-new declarative sentence, all non-final p-phrases, called

'heads' in Hayes & Lahiri's paper, have a rising pattern, analyzed here as the tone sequence L_P H_P, where the low phrasal tone is associated with the beginning of the p-phrase, and the high boundary tone with the end of the p-phrase. My analysis differs from the one proposed in Hayes & Lahiri, who assume that the initial low tone is a pitch accent L*. Against this analysis speaks the following fact. The association of the low tone shows some variation: it is sometimes linked with the first and sometimes with the second syllable of the p-phrase, as for example in their example (16) on p. 57. But this variation is expected if the early low tone is an initial phrase boundary tone rather than a true pitch accent. When the p-phrase is very long and is not initial in the sentence, the speaker may choose to realize the lower point of the phrase a bit later. By contrast, if this low tone is a pitch accent, no such variation in the alignment of the tone is expected, since a starred tone has to align with the stressed syllable. In many cases, the early low tone does not trigger any pitch movement at all.[6] When there are several small heads, Hayes & Lahiri assume that they also jointly form a head (maybe a super-head), which has a 'fall-rise' pattern, at least when it consists of two p-phrases. Not clear (because not addressed) is what happens when more than two p-phrases are grouped into a head. Logically this should then create a 'fall-rise-fall-rise' pattern.

In their analysis, the neutral sentence-final p-phrase is realized with a tone sequence H^*L_I, thus a high pitch accent followed by the low boundary tone of an i-phrase. In some cases, H* is downstepped relatively to the preceding H_P, a property that Hayes & Lahiri render by augmenting the high pitch accent with a preceding L tone, thus L+H*, since they assume that downstep is always triggered phonologically by a low tone. However, since the high boundary tone (H_P) of the preceding p-phrase is deleted when it finds itself before H* (because of the active OCP principle, which blocks the adjacency of two low tones, or of two high tones), it is not clear why downstep cannot be triggered by the unique tone remaining in the preceding p-phrase, namely L* (see Selkirk 2006:230 for a different analysis of H_P deletion).

In the analysis proposed here, in which Bengali does not have pitch accents, but in which all tonal excursions are phrasal tones, the H* tone of Hayes & Lahiri is reinterpreted as H_P.

A focused phrase causes dephrasing of the postfocal material. This is reminiscent of the effect of the nuclear stress in English, which destresses all postnuclear material. As a consequence, a focus always carries the last tonal excursion of the sentence. It has the same contour as a non-final declarative p-phrase L_PH_P, but additionally, it is followed by the final L_I, which delimits the focus domain. The focused p-phrase

is rendered in Hayes & Lahiri by the tone sequence $L^*H_PL_I$. They claim that H_P is the focus tone, because the focus domain is delimited by a rise at its right edge (see Kahn 2007 for a different approach).

Compare the following pitch tracks from my own recordings. In (10), where the focus word is preverbal, the lower level is reached at the end of the focused constituent and the final L is aligned with this point. This lower point is retained until the end of the sentence.

In (11), the initial focused word *ami* 'I' also carries the entire focus tonal structure. The remainder of the sentence is low and flat. (10) and (11) differ in their word order, and this difference also brings along a difference in the F_0 contour. The object *Ram* has a secondary accent in (10), possibly because it is a topic, but in (11), it is just flat, as it would be in English and German in the postnuclear position.

(10) $L_P \quad H_P \quad L_P \quad H_P L_I$
[[Ram-ke]$_P$ [*ami*$_F$]$_P$ [boke-che]$_P$]$_I$
Ram-ACC I scolded

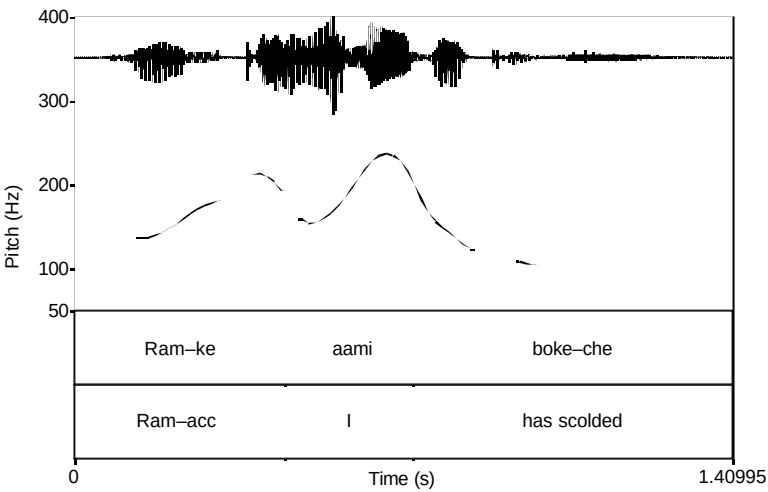

Figure 2

$L_PH_PL_I$
(11) [[*aami*$_F$]$_P$ [Ram-ke boke-che]$_P$]$_I$
I Ram-ACC scolded
'I scolded Ram.'

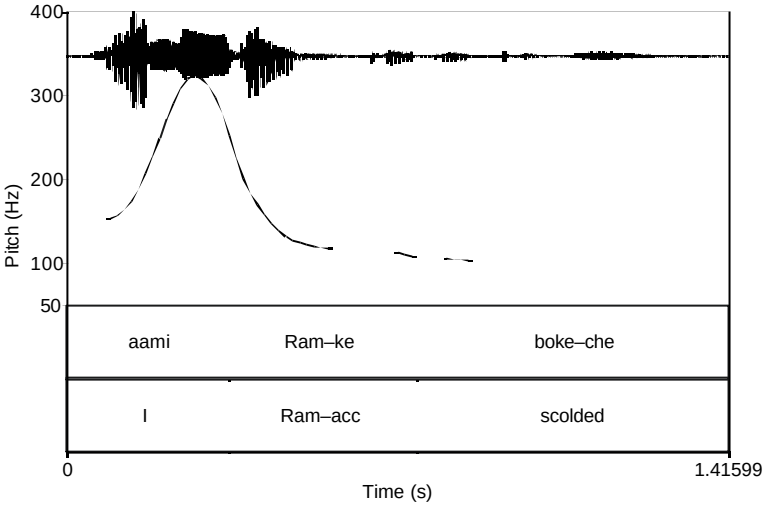

Figure 3

The choice of the one or the other word sequence is driven by the information structural context, or just by the preceding question (Gautam Sengupta, p.c.). The answer (10) is triggered by the question (12a) and (11) is a better answer to (12b). It must be noted that the pitch track of the question is identical to one of the answers. The word *ke* 'who' has the same role in (12) as the word *ami* in (10) and (11). Hayes & Lahiri postulate a complex boundary tone for the question intonation because they find that the high boundary tone of a question is higher than that of a focus. This suggestion needs to be confirmed with quantitative data.

(12) L_P H_P $L_PH_IL_I$

a. $[[\text{Ram-ke}]_P$ $[ke_F]_P$ $[\text{boke-che}]_P]_I$
Ram-ACC who scolded

b. $L_PH_IL_I$
$[[Ke]_P$ $[\text{Ram-ke boke-che}]_P]_I$
who Ram-ACC scolded
'Who scolded Ram?'

The next sentence in (13), which serves as an illustration of Bengali intonation in neutral utterances, has a complex syntactic structure and contains an embedded clause. Both the phrasal rising contour on all non-final p-phrases and the falling contour on the final p-phrase are clearly visible. Every p-phrase initial low tone L_p is linked to the beginning of the p-phrase which is projected from a full content word of the p-phrase. An example is *dekhā-korto* 'met', where the contour on

the preceding word *sāthe* 'with', a function word, is just gently interpolated from the high tone of the preceding p-phrase to the low tone on the first syllable of *dekhā-korto*. I analyze this expression as consisting of two p-phrases, one embedded in the other. The L_p has to be aligned with the beginning of the embedded one in order to be relevant for both of them. The final H_p is always aligned as far to the right in its p-phrase as possible. In all non-final p-phrases, thus, the rising contour L_pH_p is clearly present. The final p-phrase is simplified to H_pL_I, rather than $H_pL_pL_I$, because there is no indication that two low tones are realized.

High pitch scaling across sequences of p-phrases reflects the syntactic structure. The first p-phrase *chele-belā-te* 'as a child' ends much higher than the second one *Pitr̃̃* 'Peter'. The third p-phrase *sku:l* 'school' returns to nearly the same height as the first one. The relationship between *tar bondhuder* 'his friends' and *sāthe dekhā-korto* 'is meeting with' is one of an inverted downstep relation which expresses the subordination of the argument relative to the verb. The same is true for the three final p-phrases. The high tone of the last p-phrase (the verb) is higher than the preceding ones. Remarkably, it is even higher than the first high tone in the sentence. As far as I know, pitch scaling relationships have not been studied in syntactically complex sentences in Bengali. This paper is not the place to go into detail on the correspondence between pitch height and syntactic structure, but since phrasing in Bengali plays the role of pitch accents in English, it is expected that some of the functions, if not all, fulfilled by scaling of pitch accents in intonation languages are to be found in other forms in phrase languages.

L_p H_p L_pH_p L_pH_p L_pH_p L_p H_p L_p H_p

(13) [[chele-belā-te]P [pitr̃̃]P [[sku:l]P sese]P]P [tar bondhuder]P [sāthe [dekhā-korto]P]P

child-as Peter school after his friends w i t h meet-PAST-PROG3S

L_p H_p L_pH_p H_p L_I

[ebaN tāder]P [sāthe]P [anekhon khel-to]P]I

and them with many.hours play-PAST.PERF

'When Peter was a child, he used to meet his friends after school and play with them for hours.'

The verb can be integrated into the same p-phrase with the preceding argument (contra Hayes & Lahiri). This is illustrated in the following sentence in (14).

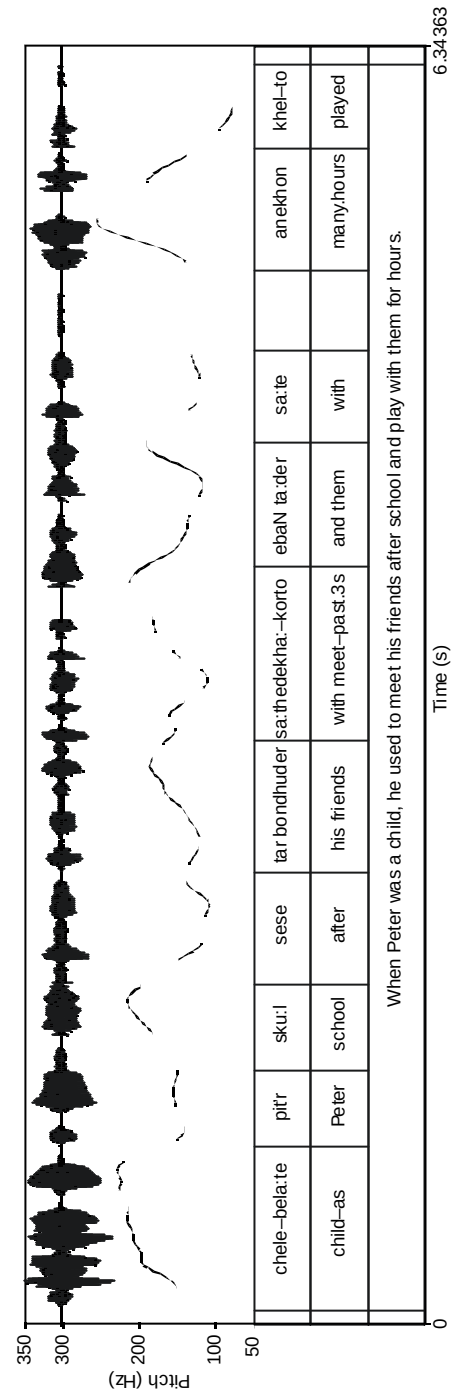
Pitch (Hz)
350
300
200
100
50
chele–bela:te
pit'r
sku:l
sese
tar bondhuder
sa:thedekha:–korto
ebaN ta:der
sa:te
anekhon
khel–to
child–as
Peter
school
after
his friends
with meet–past.3s
and them
with
many.hours
played
When Peter was a child, he used to meet his friends after school and play with them for hours.
0
Time (s)
6.34363

Figure 4

(14) L_PH_P $L_P H_P$ $L_P H_P$ $H_P L_I$
[[meri]P [onek]P [gulo]P [boi kine-che]P]I
Mary many-CLASS book buy-PR.PROG.3S
'Mary bought many books.'

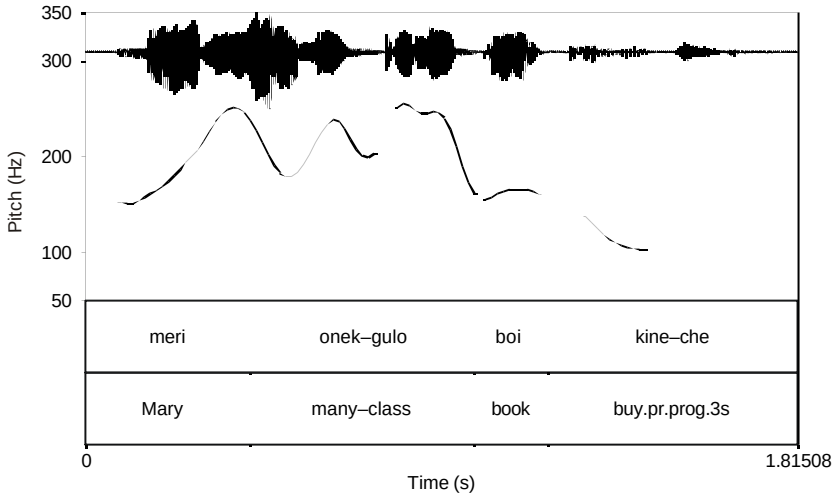

Figure 5

The following sentence (15), a reordering of the words in (14), shows a nominal phrase discontinuity: *boi* 'book' is topicalized, and the quantifier *ñ̃ek-gulo* 'many' occupies the same position as before. The quantifier is the focus of the sentence and has the effect that the verb is low and flat instead of gently descending, as before. The non-final p-phrases again have the typical rising contour and the last p-phrase is falling. In (15), the final rise for focus is on *ñ̃ek*. This high tone delimits the focus domain.

(15) L_PH_P $L_P H_P$ $L H_P$ L_I
[[boi]P [meri]P [ñ̃ek$_F$-gulo kine-che]P]I
book Mary many-CLASS buy-PR.PROG.3S

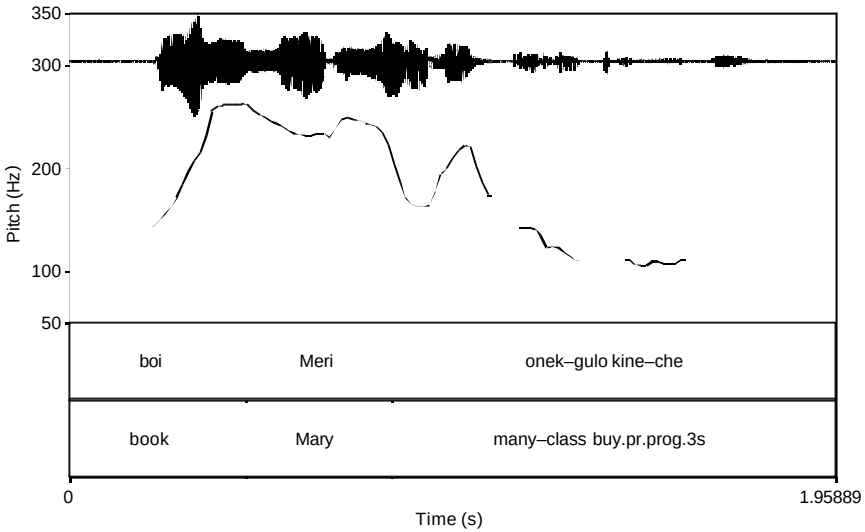

Figure 6

To sum up this section, Bengali has a phrasal intonation of the same type as observed for Hindi. In the default prosodic phrasing, every content word is phrased individually, but the phrasing can be an embedded recursive structure. All p-phrases, except for the final one, have the typical rising contour L_PH_P, whether focused or not. The very beginning, usually the first syllable of every p-phrase, is linked to a low tone L_P, and the last syllable of the p-phrase is associated with a boundary tone H_P. In the pre-final, prefocal position, the realization of the contour on all p-phrases is not guaranteed, since rhythm and speed can have the effect that some p-phrases are realized with a rather flat contour. Prominence or careful speech favor a rising pattern on every p-phrase. Focus also triggers a clear tonal pattern. A focus domain is delimited by a high tone H_P, immediately followed by the last L_I of the sentence. Pitch scaling between the high tones of a sequence of p-phrases probably plays an important role in the prosody of Bengali, but more research is needed here. The last p-phrase has a falling contour H_PL_I. It contains a high pitch accent, usually downstepped from the preceding H_P, and a low boundary, which is reached early in the final p-phrase. In the postfocal position, the tonal structure is eliminated, because the L_I is realized right after the H_P delimiting the focus domain.

As in Hindi, word order and pitch scaling are the correlates of information structure. But it is not the individual pitch accents which are in a downstep or in an upstep relation, as would be the case in an intonation language. Rather the range of an entire p-phrase can be larger or narrower, lowered or raised.

3.3 Tamil

The intonation of Tamil, a Dravidian language, has received some attention in the literature, recently from Keane (2006, 2007). In this language also, non-final p-phrases have a rising tonal contour and the final p-phrase is falling. Keane (2007) assumes that Tamil has pitch accents, and claims that the rise is L^*H_p and the fall H^*L_I. In her approach, the tonal structure of the non-final p-phrase consists of a fall-rise-fall. However, an examination of the contours in her papers confirms that the initial fall is the consequence of the interpolation between the preceding p-phrase final H and the initial L. In the same way, the final fall is the result of the interpolation between the final H_p and the L of the following p-phrase. For this reason, the intonation of Tamil's non-final p-phrases can be analyzed in the same way as that of Hindi and Bengali, namely as a rising contour. A further similarity with Bengali has to do with the status of the initial L tone, which is aligned with the first syllable of each content word. Keane analyzes this tone as a pitch accent, although she admits that Tamil does not have any lexical stress. The status of this tone is comparable to that of a postlexical pitch accent, which is not associated with a lexically stressed syllable, but rather with a position in a prosodic domain.

Exactly like Harnsberger for Hindi fifteen years before, Keane raises the question of the status of the high tone following L. The final high tone could be the trailing tone of a bitonal pitch accent or a boundary tone H_p. Keane seeks to find the answer in the alignment of this tone. Her argument goes as follows: either the high tone is aligned with the edge of the prosodic domain, and then it is a boundary tone, or it follows the L* at a fixed distance, and then it is a trailing tone. Keane (2006) finds that the location of the peak is variable. There are inter-speaker differences and also differences between lexical items, in which the peak can appear on the second or on the third syllable. Keane (2007) is an attempt to settle this issue experimentally. She measured the distance between L and H as a correlation of the duration of the word. But no stability of H relative to the end of the word could be found. Although the arguments do not all seem to point towards the same explanation, more evidence speaks for an analysis in terms of boundary. In short, her results are disappointing for an autosegmental theory of intonation which predicts that all tones have a role as either pitch accents or boundary tones.

In an analysis of Indian languages as phrase languages, the variable association of tones with syllables is a consequence of their status as phrasal tones. Tones have association domains rather than being necessarily associated with a prespecified syllable in the p-phrase.

Variation of the kind observed for Tamil, Bengali and Hindi is expected. The final H tone is associated with the phrase, and floats relative to the syllables it may anchor to.

The sentence (16), from my own recordings, illustrates the typical rising intonation of Tamil in non-final p-phrases, as well as the falling contour in the final p-phrase. It is conspicuous that in some of the non-final p-phrases, an additional but very reduced rising pattern is present, as on *oru* and on *amma* in the first and second p-phrases. I interpret these small rises as embedded p-phrases. The H tones at the end of the larger p-phrases are higher than those at the end of the smaller ones. No downstep is visible in this all-new sentence.

(16) $L_P H_P$ $L_P H_P$ L_P H_P L_P H_P L_P H_P H_P L_I

[[[Oru]$_P$ pe?]$_P$ [[ava? amma]$_P$ -vi?am]$_P$[pustakam]$_P$ [k o d u -ta:?]$_P$]$_I$

one woman her mother-to book give-s

'A woman gives a book to her mother.'

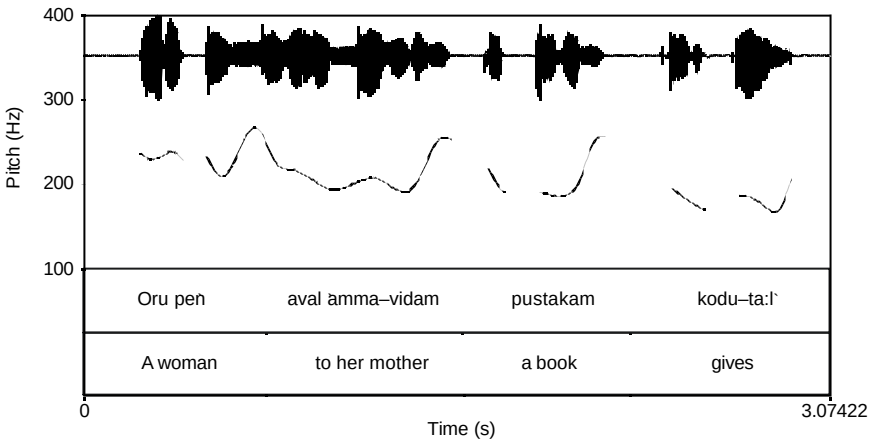

Figure 7

The next sentences illustrate that the phrasal intonation does not change much under different information structures. In (17), a sentence with canonical word order is shown.

(17) $L_P H_P$ $L_P H_P$ H_P L_I

[[meeri]$_P$ [niRaiya]$_P$ [ceer vaank-in-aaL]$_P$]$_I$

Mary many chairs buy-PST-PNG

'Mary has bought many chairs.'

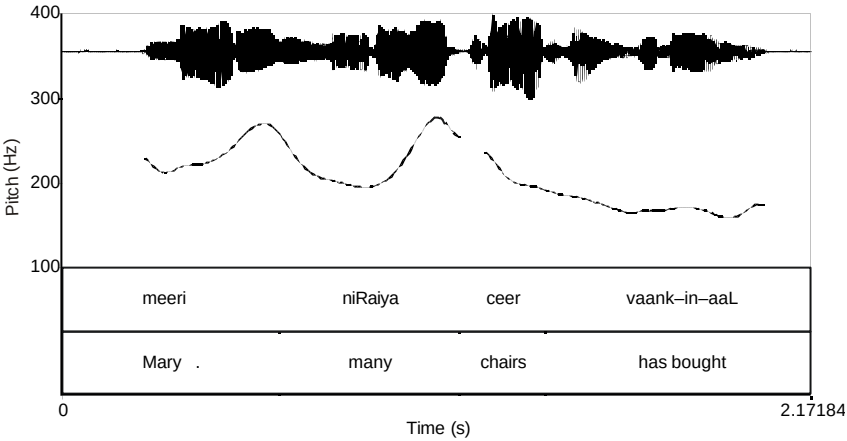

Figure 8

Sentence (18) keeps the wording of (17) but changes the word order. The direct object *many chairs* is topicalized and clearly separated from the remainder of the sentence. In none of the versions of this sentence are *many* and *chairs* included in a single p-phrase. In (17), *many* is a separate p-phrase and *chairs* forms another one together with the verb, and in (18), *many* and *chairs* each form their own p-phrase. I analyze the topicalized constituent as forming its own i-phrase.

(18) L_P H_P L_PH_P L_PH_P L_P H_I
[[[niRaiya]$_P$ [ceer]$_P$]$_I$ [meeri]$_P$ [vaank-in-aaL]$_P$]$_I$
many chairs Mary buy-PST-PNG
'Many chairs Mary bought.'

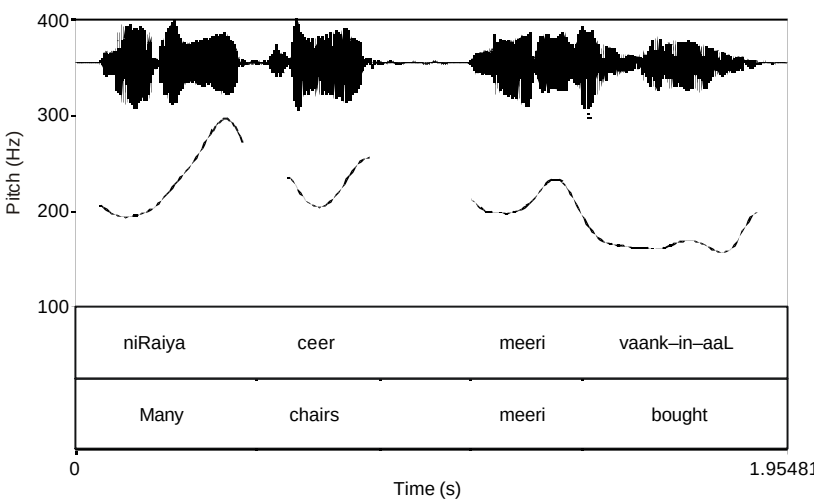

Figure 10

Sentences (16) and (17) do not show much downstep, but (18) clearly does. More data and controlled experiments of the kind conducted for Hindi by Patil et al. (2007) are needed before anything can be said about the significance of pitch scaling in Tamil.

To sum up this section on Tamil, a superficial review of some of the intonational properties of this language reveals that the prosodic and tonal patterns are similar to those found in the Indo-Aryan ones.

3.4 Malayalam

Turning now to Malayalam, another Dravidian language, we again find a language with a phrase intonation. There is no lexical stress, i.e., no lexical contrast on the basis of the stressed syllable.

The intonation of Malayalam declarative sentences is illustrated with a pair of sentences in a canonical and in a discontinuous version. Both show the typical rising intonation that we have already observed in Hindi, Bengali and Tamil. The subject in (19) has the highest boundary tone, and the following high tones are in a downstep relationship to each other. The lowest point in the second p-phrase *oru rasakaram-aya* 'one interesting' is on the first syllable of the adjective, rather than on the initial numeral, which speaks for an embedded p-phrase structure.

(19) L_PH_P L_P H_P L_P H_P H_P L_I

[[Peter]$_P$ [oru [rasakaram-aya]$_P$]$_P$ [pustakam]$_P$ [vaichu]$_P$]$_I$

Peter one interesting book read

'Peter read an interesting book.'

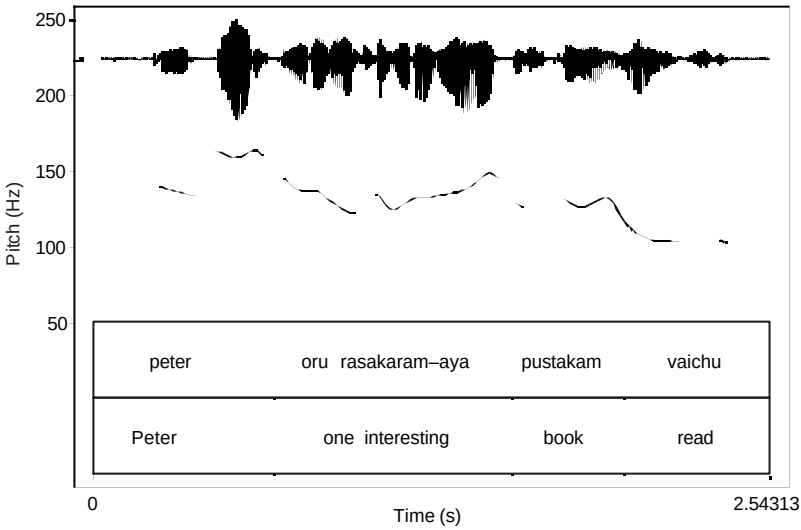

Figure 11

The same sentence with a changed word order in (20) shows that the individual p-phrases retain their phrasal intonation. But the relationship between the high tones is not the same as in (19). It is now the verb which has the highest tone, and the two preceding high tones are nearly as high but not quite. In both versions of this sentence, the verb is in a separate p-phrase. The topicalized constituent *pustakam* forms its own i-phrase.

(20) $L_P H_P$ $L_P H_P$ $L_P H_P$ $H_P L_I$
[pustakam]$_I$ [[Peter]$_P$ [vaicha-atu]$_P$ [rasakaram]$_P$]$_I$
book Peter read-REL interesting

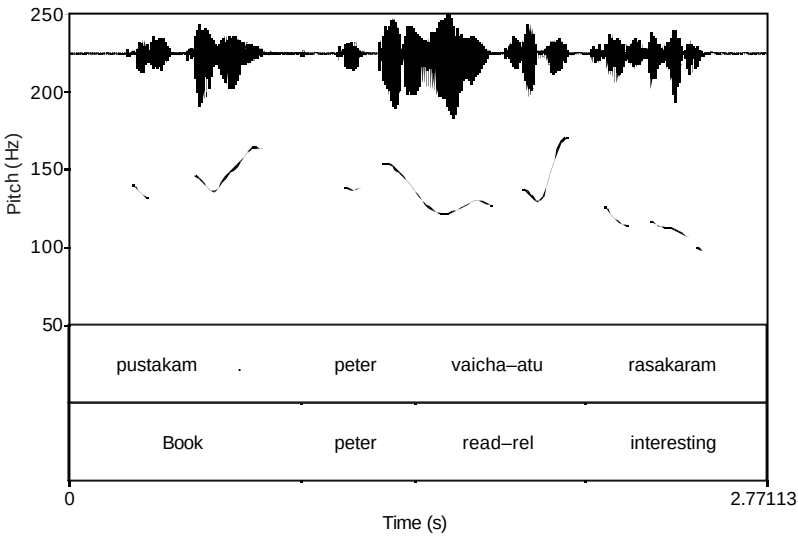

Figure 12

Obviously, more research is needed on the prosodic and tonal structure of Malayalam. However, judging from the two sentences and from the results obtained for the other languages, prosody will not play a very important role in the expression of information structure. For this part of the grammar, Malayalam has different strategies at its disposal, namely morpho-syntactic ones (see Jayaseelan 2001 for a syntactic analysis of focus movement). In (21), it is shown how a sentence changes its shape when put in different information structural contexts.[7] In the all-new sentence in (21a), a suffix *-anu* 'be' is attached to the verb, with the first vowel elided. This suffix is assumed to be a focus particle, which attaches to the focused constituent and which may be interpreted as the copula of a cleft construction (see Wiederhold 2008 for this interpretation). In the default case, when the sentence is all-new, the verb serves as the anchoring place for the particle. In (21b), the focus

particle *-anu* is anchored to the narrowly focused subject *strii* 'lady'. This narrowly focused constituent is preverbal, which is the preferred, but not exclusive, focus position. The given object is moved into a postverbal position. In (21c), the verb is contrastively focused, and it takes the suffix again, but with a different verb form than in (21a). In both (21d) and (21e), the focused object is suffixed with *-anu*, but there is a difference in word order. The information focus in (21d) is located postverbally and the corrective focus in (21e) appears in the preverbal position. In (21f), with two foci, only the first focus takes the suffix and the other one is prosodically prominent. In short, Malayalam has at least two strategies for the expression of focus: suffixation of a focus particle and change of word order. It could be that prosodic means, like increase of register, are available as well, but again more investigation is necessary.

(21) a. {What is happening?}
strii veḷḷam kuḍikkun-nu
lady water drinking-*f*-be
'The woman is drinking water.'

b. {Who is drinking water?}
strii-anu kuḍikkunnathu veḷḷam
strii-anu veḷḷam kuḍikkunnathu

c. {What is the woman doing?}
strii veḷḷam kuḍikuka-y-anu
(she drank the water, she did not spit it)

d. {What is the woman drinking?}
strii kuḍikkunnathu veḷḷam-anu

e. {Is the woman drinking wine?}
strii veḷḷam-anu kuḍikkunnathu

f. {Who is drinking what?}
strii-anu kuḍikkunnathu veḷḷam

To sum up, Malayalam has the same kind of prosodic pattern as observed for Tamil and the Indo-Aryan languages Hindi and Bengali. Like in the other languages, the prosodic pattern of both the pre-final and the final p-phrases does not change much under information structural influences. Malayalam illustrates that information structure is expressed by morpho-syntactic means rather than by prosodic ones.

4. Conclusions

It has been proposed in this paper that some of the main Indian languages, Hindi, Bengali, Tamil and Malayalam, show common intonational properties. They belong to a group of languages called *phrase languages*, which have no lexical stress and also no pitch accent.

Other languages in the same group are Korean and West Greenlandic. I propose phrase languages as a new intonational category, based on sentence intonation, besides the existing intonation languages, pitch accent languages and intonation languages. The four Indian languages examined in the paper organize the tonal pattern of their declarative sentences on the basis of phrase tones, which are anchored at the level of the prosodic phrase. Lexical items do not project any tones. Very few pragmatic meanings are conveyed by changes of tones, though manipulation of pitch range may be a more common device, requiring in-depth studies. The pattern exemplified by declarative sentences in Hindi, Bengali, Tamil and Malayalam consist in a rising contour, decomposed in a low tone associated with the beginning of the p-phrase, and a low tone associated with the end of the same p-phrase. Sentence-final p-phrases have a falling contour with an early high tone and a late low tone.

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NOTES

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2. Other languages spoken in India have a completely different intonation pattern from the one introduced in this paper. Tone languages, like Tai (Khamti and Khamyang), Tibeto-Burman (Mishmi) or Mon-Khmer (Khasi), are to be treated differently. These languages are not part of the present study.
3. There is an ongoing debate in the literature as to the number of larger prosodic domains needed, and what they are called. Jun (2005) lists 'Accentual Phrase,' 'Intermediate Phrase' and 'Intonation Phrase' as prosodic units above the word. Other terminologies include 'Focus Domain,' 'Prosodic Phrase,' 'Phonological Phrase,' 'Minor Phrase,' 'Major Phrase' and many more.
4. Even more intriguing is a result by Féry & Kentner (in prep) which shows that prosody is not used in Hindi for the disambiguation of groupings of names, like (a and b) or c as opposed to a or (b and c).
5. According to Gautam Sengupta (p.c.), (8) has a scrambled word order. A more natural word order for this sentence places the direct object 'scarf' in the preverbal position.
6. See for instance examples (20) and (21) on pages 60 and 61 in Hayes & Lahiri's paper.
7. Thanks to Kiran Kishore for providing and discussing these data.