Bengali intonation revisited:
An optimality theoretic analysis
in which FOCUS stress prominence drives FOCUS phrasing*

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1. Introduction

In this paper, I want to investigate the consequences of an idea about focus prosody that was first put forward by Jackendoff 1972, namely the hypothesis that the focus-phonology interface in grammar is expressed as a relation between focus-marked syntactic constituents on the one hand, and prosodic stress prominence on the other. A strong form of the hypothesis, advocated in Truckenbrodt's 1995 thesis and pursued here and in other recent work of mine (e.g. Selkirk 2002), is that the focus-phonology interface consists *only* of interface constraints on the relation between syntactic focus and prosodic prominence. All the other predictable, non-morphological, phonological properties of focus are claimed to be derived as a consequence of phonological markedness constraints on the relation between prosodic prominence and other aspects of phonological representation. This proposal can be called the Focus-Prominence theory of the focus-phonology interface. I think this theory provides an insightful account of the array of phonological properties that are associated with focus crosslinguistically, and at the same time explains the observed generalizations about focus projection and the distribution of focus-related prominence within the sentence. The question of focus projection is not addressed in this paper (but see Selkirk 1999, 2000; Selkirk and Katz, in preparation). What I want to show here is that Focus Prominence theory provides the basis for an understanding of focus-related phonological phrasing. In this I am following a path first charted out by Truckenbrodt 1995.

Focus constituents are claimed to display a variety of prosodic properties crosslinguistically:

i. appearance of special tonal morphemes [1]
ii. appearance of default pitch accent[2]
iii. demarcation by a prosodic phrase edge[3]
iv. presence of main stress of a prosodic phrase[4]
v. appearance in a higher pitch range [5]
vi. vowel length under main phrasal stress [6]
(This list should not be taken to be exhaustive.)

Should there be distinct focus-prosody interface constraints to account for each of the diverse non-morphemic prosodic properties listed above? I think not. The Focus Prominence hypothesis holds that there is a *prevalent commonality* to the phonological expression of focus, in languages of diverse types, and that it lies in the level of stress

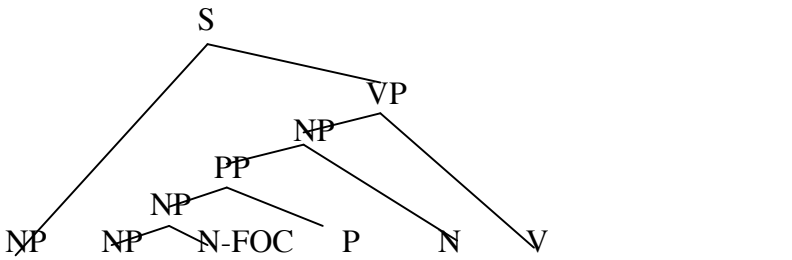
prominence assigned within a focus constituent. The appeal of this hypothesis is that stress prominence, at the appropriate designated level, is quite plausibly responsible for the various other reported phonological reflexes of focus, be it the appearance of default pitch accents to mark stress prominence, the lengthening of vowels under that prominence, or the appearance of a phonological phrase.edge adjacent to that prominence.

So under the Focus Prominence theory there are no constraints *directly* relating predictable pitch accent or prosodic phrasing to the focus-marking of constituents in the interface syntactic structure. For example there would be no constraints of the form Align L/R (Focus, π) where π is a prosodic constituent of a selected level. Rather, following Truckenbrodt's 1995 proposal, the presence of a π edge flanking a focus would be the consequence of a constraint calling for the focus constituent to contain a prosodic prominence together with a a prosodic alignment constraint calling for a prominence to be located at the edge of the prosodic constituent of which it is the head[7].

Bengali presents an apparent counterexample to the claim made by Focus Prominence theory that the phonological phrase edge alignment that appears with focus can be derived through the markedness-driven alignment of a prosodic phrase edge with the stress prominence of that phrase. The prominence-based theory of focus phrasing predicts a phonological phrase edge at only *one* edge of a focus constituent, the edge where the focus prominence is located. But according to Hayes and Lahiri in their classic 1991 article on Bengali intonation, a focus constituent in Bengali is *flanked* by phonological phrase edges at *both* the right *and* the left edges of the focus. The stress prominence of a phonological phrase in Bengali is claimed by Hayes and Lahiri to be located at the left of the phrase. So within the Focus Prominence theory, the appearance of a phonological phrase edge at the left edge of a focus constituent could be derived through an instance of the familiar sort of surface phonological markedness constraint *Align R/L (π-prom, π),* which aligns a π-prominence with a π-edge (*π-prom* is the prominent daughter constituent of π (its head)). It is the right phrase edge with focus that poses the problem. There is no evidence elsewhere in the language for the alignment of a phonological phrase with the right edge of a constituent. So Hayes and Lahiri propose a focus interface alignment constraint—formulable as *Align R (Focus, φ)*-- to account for the right phrase edge (φ stands for phonological phrase). The present theory, which seeks to eliminate focus-phrasing alignment constraints from the universal interface constraint repertoire and to reduce all nonmorphemic, phonological, reflexes of focus to reflexes of stress prominence, will require some principled non-prominence based explanation for the right phrase edge with focus in Bengali. The purpose of this paper is to put forward such an explanation.

An example of the focus phrasing seen in Bengali appears in sentence (2) below. (2) is a sentence with a sentence-medial contrastive focus appearing on a medial constituent within a left branching object noun phrase. The surface syntactic structure which we tentatively assume for this focus-marked sentence structure is as in (1). The prosodic phrasing structure in (3), which is an all-new, out of the blue, utterance of the same sentence structure, but minus the focus marking, should be contrasted to that in (2)[8].

(1)



□□□ □□□□□-□□□□-□□□□□□□□□□□□□□□

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phrase-edge not prominence-related

(2) L* H_P L* H_P L_I

((□□□□□□□□□) (□□□□□□□) □□□□□□□□□□□□□□□□)$_{IP}$

I king's PICTURES for money gave.

(3) L*H_P L* <H_P> H* L_I

((□□□□) (□□□□□□□□□□□□□□□□□□□□□□□□) (□□□□□□))$_{IP}$

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These are both declarative utterances. The phrasing of the neutral focus sentence (3) puts the subject , the complex NP object, and the verb each in a separate phonological phrase. (Nonfinal phonological phrases are in general marked by two tonal events--the presence of a L* pitch accent on the main stressed syllable in the phrase and the presence of a H_P peripheral tone at the right edge of the phrase.) The focus sentence (2) alters the otherwise default phrasing in flanking the focus constituent, here a head noun internal to the complex noun phrase, with the left and right edges of a phonological phrase. The arrow marks the problematic right phonological phrase edge found at the right edge of the focus, the phrase edge that the Focus Prominence hypothesis can't account for.

Aside from the flanking of a contrastive focus constituent with phonological phrase edges, there is another important property of sentences with focus in Bengali, namely the absence of any phonological phrase following the focus constituent. This is visible in (2) through the absence of any pitch accent or nonfinal peripheral tones following the focus. We will see that this apparent "dephrasing" can also be given an explanatory account by Focus Prominence theory, in terms already suggested by Truckenbrodt 1995 for Japanese (section 2).

2. Sketching out the Focus Prominence theory

I am going to assume that an utterance is simultaneously analyzed in terms of two discrete types of structure—morphosyntactic and phonological. Specifically, the assumption is that the two output representations defined by the grammar for a sentence, namely the surface morphosyntactic representation (PF) and the surface phonological representation (PR), share a terminal string. This assumption about the interfacing

output representations predicts three general types of constraint that would be defined on output representations alone: morphosyntactic markedness constraints, phonological markedness constraints, and interface constraints relating morphosyntactic and phonological properties of the output. Syntactic structure-prosodic structure alignment constraints such as Align-L (XP, MaP) are a classic type of interface constraint. They have a demarcative function, in calling for the edge of a designated category in the syntax to correspond to the edge of a designated category of prosodic structure (cf. Selkirk 1986 et seq). In addition, the family of Wrap constraints proposed by Truckenbrodt 1995, 1998 has a cohesive function in requiring that a syntactic constituent of a particular level be entirely contained within a prosodic phrase of a particular level. These Align and Wrap constraints on the syntax-phonology interface clearly have the function of carrying over into the hierarchically organized phonological/prosodic representation of the sentence salient, landmark, properties of the morphosyntactic phrase structure constituency. These constraints, which are apparently cross-categorial, ignore any featural properties of the morphosyntactic representation. Constraints relating focus and prosodic prominence of the sort being proposed in Focus-Prominence theory belong to a distinct class of syntax-phonology interface constraints. A morphosyntactic constituent with the property of being a focus is assumed to be focus-marked (Jackendoff 1972, Selkirk 1984, 1995, Rooth 1992, 1995, Schwarzschild 1999 and many others), so that any constraint calling for a focus-marked constituent in PF to contain a certain level of prosodic prominence in PR is a syntax-phonology interface constraint. But the difference between this and the Align/Wrap constaints is that information structural salience, represented as a property of individual morphosyntactic constituents, is being translated into prosodic structure salience, or prominence. Thus the two defining properties of prosodic structure-- prosodic grouping structure and prosodic prominence, or headedness— correspond to the two faces of surface morphosyntactic structure—phrase structural grouping and an encoding of information structural prominence.

What then might be the formulation of the Focus-Prominence interface constraints that are being given responsibility for at least some of the focus phrasing properties of Bengali? Providing a fully motivated answer to this question is a topic of ongoing research, but it is possible to say something here of the ideas under consideration. Truckenbrodt 1995 and Rooth 1996 propose a Focus Prominence constraint that is essentially syntagmatic in character:

(4) **Focus Prominence Constraint—syntagmatic** (Truckenbrodt 1995, Rooth 1996)

A focus is more prominent than any other element within the focus domain.
[where *focus* and *focus domain* are syntactic/semantic constituents]

In its definition of focus prominence this theory does not distinguish between types of focus (e.g. contrastive vs. presentational) and their associated types of domain constituent. Nor does the theory assure a regular prosodic level of prominence for the different focus types. In other work, however, this simplicity is shown to be problematic for the characterization of at least a certain range of focus phenomena (see Selkirk 2000, 2002; Sugahara 2002, 2003). So in what follows I will assume a paradigmatic theory of

Focus Prominence, leaving open the question whether the syntagmatic version above is *also* required in grammar.

The paradigmatic theory of Focus Prominence that I am entertaining posits a family of Focus Prominence constraints of the general form in (5), according to which a focussed constituent of a particular morphosyntactic structure type must contain a phonological prominence of a particular prosodic structure type:

(5) **Focus-Prominence Constraint Family—paradigmatic (Selkirk 2000a, 2002)**

$f(X^n) \subset \Delta(\pi)$

"The terminal string of an *f*-focussed syntactic constituent of level X^n in PF (the interface morphosyntactic representation) is a terminal string of PR (the interface phonological representation) which contains the designated terminal element Δ of a prosodic constiuent of level π."

i. *f* is a variable over focus types (contrastive, presentational, …)
ii. X^n is a variable over syntactic constituent types (word, phrase, …)
iii. Δ stands for "designated terminal element of" (see below), and
iv. π is a variable over prosodic constituent types

Of particular relevance to the current paper is a constraint relating the presence of a contrastively focussed constituent in the syntax to the presence of a prosodic prominence of the Intonational Phrase level in the phonology. The formulation in (6) appears to achieve the correct results for Bengali.

(6) **FOCUS Prominence** : $\text{FOCUS}(\alpha) \subset \Delta\text{IP}$

"The terminal string of a contrastively focussed ("big" FOCUS) constituent of level α in PF ($=\alpha_{FOC}$) is a terminal string of PR which contains the designated terminal element Δ of an Intonational Phrase."

Contrastive focus invokes a set of alternatives and its semantics can be characterized by alternatives semantics (Rooth 1992, 1995). I am suggesting here that it is an intonational phrase-level prominence that is called for in a contrastive focus constituent (notated with big caps as FOCUS and referred to as 'big' focus.) As for other Focus Prominence constraints, they would include, at a minimum, constraint(s) relating words or phrases that are in presentational focus to presumably lower levels of prosodic prominence, for example:

(7) **Focus XP Prominence:** $\text{Focus(XP)} \subset \Delta\text{MaP}$

"The terminal string of a presentationally focussed ("small" Focus) constituent of level XP in PF ($=XP_{Foc}$) is a terminal string of PR which contains the designated terminal element Δ of a Major Phrase."

A presentational focus has the property of newness in the discourse, and its semantics is characterizable in terms of the theory proposed by Schwarzschild (1998). It will sometimes be notated with initial caps as Focus and nicknamed as 'small' focus. As for the prosodic category name 'major phrase', this is the level of phrasing immediately below the intonational phrase, sometimes also referred to as 'intermediate phrase.' I have chosen the term 'major phrase' for its mnemonic value, since the level of prosodic *major* phrase is identified by its alignment with the morphosyntactic *maximal* projection phrase.

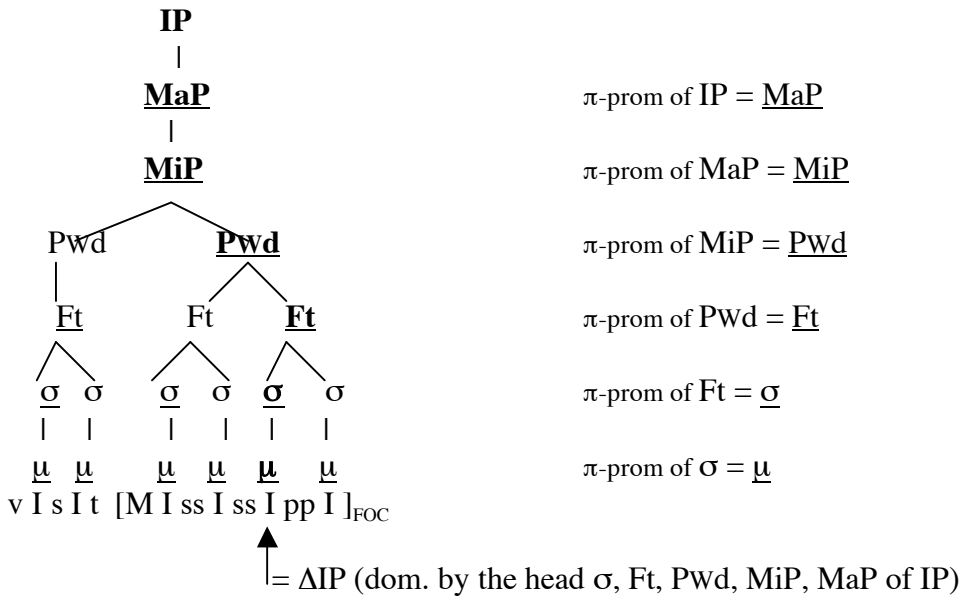
Notice that these hypothesized constraints of the paradigmatic Focus Prominence theory make the felicitous prediction that the phonological properties of big, contrastive, FOCUS are either a superset of those of small, presentational, Focus, or, if different, then are characteristic of a higher level of prominence than those of small focus. This is because, given the nature of prosodic structure, the ΔIP called for in a big focus constituent is necessarily *also* a ΔMaP, and ΔMaP is what is called for in a presentational focus phrase. That is, both contrastive and presentational focus will be called on by constraints to show the properties of a ΔMaP , but only contrastive focus will be called on to show the properties of the higher level ΔIP. Call this prediction *big focus-small focus containment*. This point becomes clear when we examine the definitions for designated terminal element and prosodic head and apply them to an example.

(8) Def: A *head of a prosodic constituent* π is (i) the most prominent prosodic constituent immediately dominated by π (the *π-prom* of π) or (ii) the most prominent prosodic constituent immediately dominated by a head of π.

(9) Def. The *designated terminal element* (DTE, or Δ) of a prosodic constituent π is that mora in the terminal string of π that is dominated by the chain of heads of π.

Note that the sample representation (10) satisfies the Focus Prominence constraint in (5) which requires that the contrastively focussed word *Mississippi* contain the designated terminal element of an intonational phrase IP.

(10)



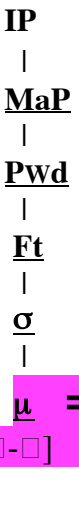
(Underlining will be consistently taken to denote head status.) According to the recursive definition of head given above, the boldfaced head constituents are all heads of IP. Assuming that moras are part of the terminal string, the penultimate mora in *Mississippi* is the designated terminal element of IP. This is because it is the head mora of the head syllable of the head foot of the head prosodic word of the head minor phrase of the head major phrase of the intonational phrase.

Turning to Bengali, we will assume that the focus type whose prosodic properties are being described in the Hayes and Lahiri paper is big, contrastive, focus. Their examples of focus involve cases of explicitly contrastive focus or answers to wh-questions. So we will be investigating in Bengali the consequences of assuming that a big focus (FOCUS) constituent contains the DTE of an Intonational Phrase, as called for by the big FOCUS Prom constraint in (5). The properties of presentational focus in Bengali have not yet been submitted to a systematic investigation.

Let's look at the general shape of the analysis I am proposing for the flanking of a contrastive FOCUS-marked syntactic constituent by phonological phrase edges in Bengali. First, FOCUS-Prom (6) calls for a ΔIP within the FOCUS constituent. This has the consequence that the ΔIP is dominated by the head MaP of IP, the head of that head MaP, and so on, as seen in the partial representation in (11) below:

(11) [Partial prosodic structure 1]

FOCUS-Prom ⇒



[[□□□] [[[[□□□□□-□] [□□□□□-□]$_{FOC}$] □□□□□□] □□□□] [□□□□□]]]

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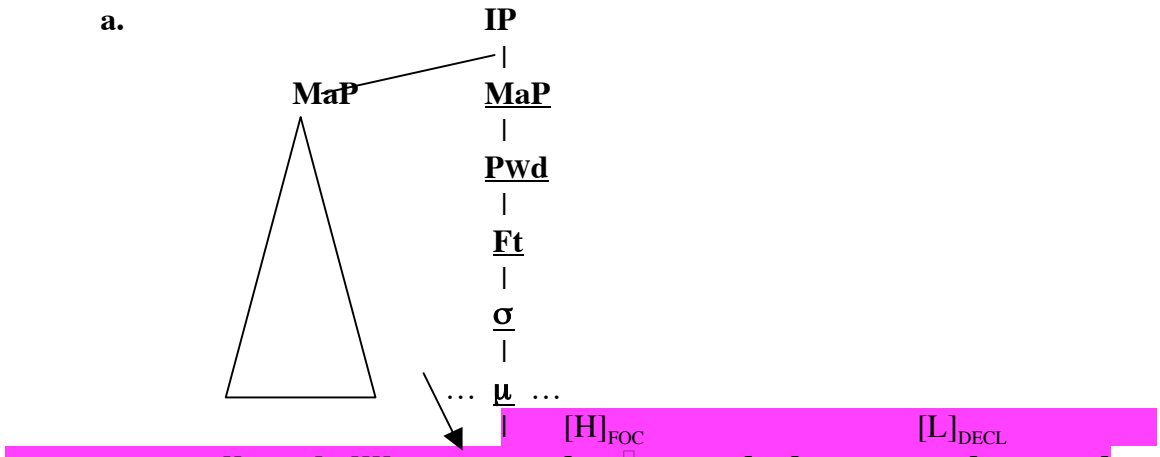
In meeting the requirements of the FOCUS-Prominence constraint, head constituents are defined at all prosodic levels lower than IP. Now, the grammar contains a class of prosodic markedness constraints that call for the alignment of these prosodic head constituents with the right or left edge of their mother prosodic constituents (McCarthy and Prince 1993) such as the well-attested Align R/L (Ft, PWd). Hayes and Lahiri argue that a phonological phrase has its head at the left edge of the phrase, giving a pattern of left edge phonological phrase prominence. I will express this constraint as Align L (PWd, MaP), assuming that the phonological phrase appealed to in the constraint is at the level of the major phrase and that it is a prosodic word level head-constituent that is aligned with the MaP left edge. (This analysis ignores for reasons of expository convenience the possibility that there may be an additional level of phonological phrase (the Minor Phrase) intervening between PWd and MaP, as does the analysis of Hayes and Lahiri.) Following Truckenbrodt's 1995 analysis of the left phonological phrase edge that appears with FOCUS in Japanese, my analysis of Bengali gives this prosodic alignment constraint the responsibility for the flanking of Bengali FOCUS with a left phonological phrase edge, as shown in (12a). [Note that (12a) is only a partial prosodic tree and (12b) is a partial prosodic labelled bracketing.]

(12) [Partial prosodic structure2]

Align L (PWd, MaP) ⇒

a.



[[□□□] [[[[□□□□□-□ [□□□-□□□-□]FOC] □□□□□□] □□□□] [□□□□□]]]

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b.

IP((ami □□□□□□)MaP MaP(□□□□□□ □□□□□□□□□□□□□□□)IP

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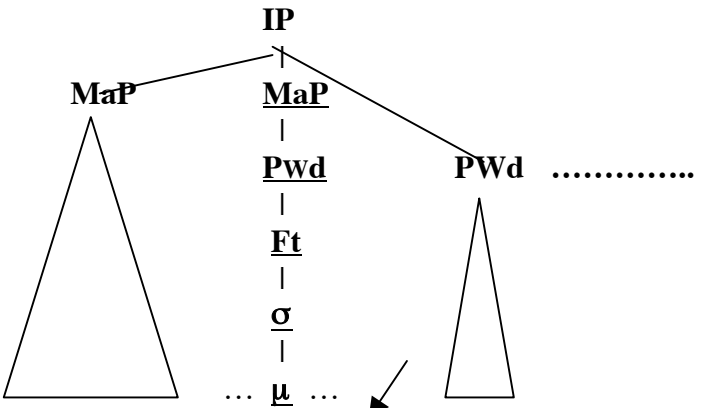
On this proposal, then, a constraint like AlignL (PWd, MaP) has in general two functions. Here it induces the presence of a phonological phrase edge at the edge of a prosodic prominence whose position with respect to the syntactic structure is fixed by the FOCUS-Prom constraint. In cases where the location of the prominence is not fixed by an interface constraint, the same constraint predicts that the prominence will fall wherever the grammar determines that the left edge of a phonological phrase might appear. This two-fold effect follows from the fact that the locus of prosodic prominence may either be fixed independently in which case the edge comes to align with it, or the locus may not be fixed independently, in which case the prominence locates itself wherever the grammar may call for a phrase edge.

As for appearance of the right edge of a phonological phrase edge seen in (13) at the right edge of FOCUS, I argue in the following section that it is to be ascribed to the presence of the tonal morpheme $[H]_{FOC}$ at the right edge of the FOCUS constituent in *morphosyntactic* structure.

(13) [Partial prosodic structure3]

Align R ([H]$_{FOC}$, MaP) ⇒

a.



[[□□□] [[[[□□□□□-□ [□□□□□-□]$_{FOC}$] □□□□□□] □□□□] [□□□□□]]]

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b. [H]$_{FOC}$ [L]$_{DECL}$

$_{IP}$(□□□□□□□□□) $_{MaP}$(□□□□□□)$_{MaP}$ □□□□□□□□□□□□□□)$_{IP}$

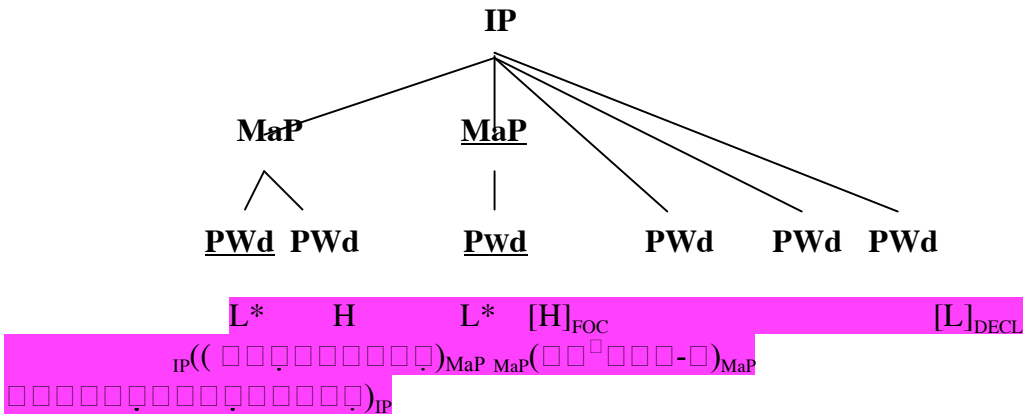
The (a) examples of these partial representations contain the morphosyntactic labelled bracketing of the sentence, which includes the marking for contrastive big FOCUS on the phrase-medial noun *pictures,* as well as what I will argue below are the tonal morphemes for FOCUS and DECLARATIVE, [H$_{FOC}$] and [L]$_{DECL}$ respectively. The hypothesis is that the morphemic contrastive FOCUS tone is lexically specified to appear at the right edge of a phonological phrase, through the effect of a morpheme specific alignment constraint Align R ([H]$_{FOC}$, MaP). This constraint induces the presence of the phonological phrase edge at the position at the right edge of FOCUS constituent that the FOCUS morpheme is hypothesized to occupy in morphosyntactic structure. Hayes and Lahiri in fact argue that the H phrase-edge tone of FOCUS is morphemic in Bengali; the present proposal simply draws the consequences of that morphemic status within the framework of assumptions adopted here. In section 3 I give arguments for the morphemic status of the focus H tone.

There is a final phrasing property of big FOCUS sentences, one that is also arguably a prosodic prominence alignment effect, namely a "dephrasing" to the right of the FOCUS constituent. No tones appear between the right edge of the FOCUS constituent and the end of the sentence in Bengali. This can be seen in example (2). The post-FOCUS stretch is demarcated at the beginning by the [H] morphemic tone that appears at the right edge of the FOCUS and at the end by the sentence-final illocutionary tonal morpheme. Between them, there are no prominence-marking pitch accents, nor any phrase-edge-marking H peripheral tones. Since tones mark these prosodic structure landmarks of a phonological phrase by default, the absence of the tones is most straightforwardly

explained by the post-FOCUS absence of the phonological phrasing and prominence that trigger the presence of these tones . This sort of post FOCUS "dephrasing" is argued by Truckenbrodt 1995 to result from a constraint which calls for the prosodic head of an intonational phrase to align with the right edge of the IP. Any phonological phrase intervening between the FOCUS phrase and the right edge of the intonational phrase would be disaligning and so produce a non-optimal prosodic representation for the sentence. In particular, after FOCUS one never sees the appearance of the phrasing normally associated with the matrix verb. So the provisional)constraint "Verb-φ Align" (see footnote 8) must be dominated by the IP-level prosodic alignment constraint. I will assume that the "dephrasing" observed in the optimal candidate moreover constitutes a violation of Exhaustivity (IP), hence:

(14)

Align R (MAP, IP) >> Exhaustivity (IP), "Verb-φ Align" ⇒



The section below is devoted to establishing that the account I have proposed for the appearance of a phonological phrase edge at the right of the FOCUS constituent is well founded. It will rely on establishing the morpheme status of the H tone that flanks the FOCUS constituent on the right as well as establishing the existence of a morpheme-specific alignment constraint that may induce the presence of a phonological phrase edge at the edge of the FOCUS tonal morpheme.

3. Tonal Morphemes in Bengali sentence tonology

The preceding analysis of Bengali FOCUS prosody has adopted many of the assumptions of Hayes and Lahiri's masterful (1991) account: the notion that phrasing is central to an account of the distribution of tones; the notion that phrase stress is leftmost in the phonological phrase, while stress prominence in the intonational phrase is rightmost; the notion that a $[H]_{FOC}$ tonal morpheme must be posited. Where the account proposed here crucially differs from Hayes and Lahiri's is in giving the $[H]_{FOC}$ morpheme responsibility for the FOCUS-related phrasing. A more general difference is that the account offered here is a constraint-based optimality theoretic account which seeks to provide an explicit, exhaustive, analysis of all the relevant tonal patterns in Bengali as well as of all the

relevant phrasing patterns in the language. Specifically, the aim is provide a complete account of the tonological differences between declarative and question utterances under both "neutral" and contrastive focus conditions. We will see that the H tone that appears at the right edge of a FOCUS constituent has a significantly different behavior from the peripheral default H tone that is the regular marker of right edge of phonological phrase.

3.1 The intonation of neutral focus sentences

3.1.1 The default L* H_P pattern for phonological phrases

To begin, we will look at Bengali sentences with so-called neutral or broad focus, starting with a treatment of the default L* pitch accent and H edge tones that mark nonfinal phonological phrases, as seen in (3). A pitch accent is simply a tone whose distribution is defined with respect to a prosodic prominence. The insertion of a default, non-lexically specified, pitch accent is a type of prosodic enhancement and must be the consequence of a phonological markedness constraint calling for the designated terminal element of a prosodic constituent to be associated with some tone. Constraints of this type are known to play a role in the world's languages[9]. The insertion of a default edge tone is also a variety of prosodic enhancement, this time serving to demarcate prosodic phrase edges. It must be the result of a markedness constraint calling for the edge of a phrase to be aligned with a tone. Again, such constraints are attested crosslinguistically [10].

It is likely not a coincidence that the pitch accent and peripheral tone of the Bengali phonological phrase have polar tonal values, and indeed Hayes and Lahiri argue that the Obligatory Contour Principle (OCP) has a central place in Bengali tonology. For reasons to be seen right below, the OCP-based analysis offered here picks out the pitch accent as the tonal element whose polar value is a function of the other. The High value of the peripheral tone will be specified by an edge-tone alignment constraint, as in (15a). With the High edge specified by constraint, the introduction of the polar Low value for the pitch accent can be achieved by a combination of the prominence-tone association constraint in (15b) and the OCP.

(15) a. **Align R (MaP, H tone)**
"Align the R edge of a major phonological phrase with the R edge of a H tone."
[= the source of the default High edge tone]

b. **Associate (ΔMaP, Tone)**
"Associate the designated terminal element of a major phonological phrase. i.e. the head mora of the MaP, with some Tone."
[= the source of a pitch accent on ΔMaP, which is realized as either L or H, as dictated by the OCP]

The tableau in (16) illustrates the role for these constraints in deriving the tones of the initial phonological phrase from the sentence in (2):

(16)

…. [ami] [[□□□□□-□]...	OCP	Align R (MaP, H)	Assoc (ΔMaP, T)	*Tone
a. … (□□□□□□□□□)$_{MaP}$….		*!	*	
⇒ L H b. … (□□□□□□□□□)$_{MaP}$				**
H H c. … (□□□□□□□□□)$_{MaP}$	*!			**

The two constraints in (15),which call for the presence of tone in the representation, crucially outrank the constraint *Tone, which minimizes the presence of tone in the representation. The OCP adjudicates the choice of tone, and is not crucially ranked with respect to the others. (The non-ranking among the higher constraints is provisional.)

There is another role for the OCP. In addition to assuring the non-identical character of the tones introduced by default into the representation, as here, Hayes and Lahiri also propose that it is responsible for the failure of the default H edge tone to appear in the first place, when it is followed by another H tone in the utterance. This effect is seen in (3), where the bracketed perpherial <H> tone is actually not realized, because of the H* that follows in the next phrase. The absence of that peripheral H will be analyzed below.

3.1.2 The tonal patterns of final phrases

The default L* H phrasal tone pattern is preempted in the final phrase of the sentence by the tonal morphemes expressing the illocutionary force of the sentence. The patterning of tones in the final phonological phrase of the sentence is contrastive, and is a function of the declarative vs. interrogative status of the utterance, together with the the FOCUS status of the elements within the final phrase. The basic, neutral focus, declarative ends in a H* pitch accent followed by L boundary tone, while the basic, neutral focus, yes-no interrogative ends in L* plus HL boundary tone combination.

Compare the declarative non-FOCUS sentence in (17) with the non-FOCUS interrogative in (18).

(17) L*H L* H* [L]$_{DECL}$
(ami) (□□□□□□ □□□□□□ □□□□□□□□□) (□□□□□)
I king's pictures for money gave
"I gave money for the king's pictures."

(18) L*H L* H L* [HL]$_{QUES}$

(ami) (□□□□□□□□□□□□□□□□□□□□□□□□□□□) (□□□□□□)
I king's pictures for money gave?
"Did I give money for the king's pictures?"

According to Hayes and Lahiri, the H* L of the declarative is composed of an underlying H* declarative morpheme followed by a L sentence-final 'neutral' morpheme, while the L* HL of the yes-no interrogative is composed of an underlying L* interrogative morpheme and a peripheral HL 'yes-no' morpheme. Operating within a pre-OT framework of assumptions, Hayes and Lahiri propose that the OCP has a role to play in determining possible tonal contours in Bengali, but they do not exploit this idea fully in the analysis of these contours. I would like to suggest, as an alternative OT-based analysis, that the final boundary L of the declarative is the declarative morpheme itself, and that the H * pitch accent preceding the declarative morpheme $[L]_{DECL}$ is not morphemic. Rather that H* is a default pitch accent whose quality is determined by the OCP on the basis of the L quality of the declarative morpheme, as shown schematically in (19a). Similarly, the HL boundary combination can be taken to be the morpheme for the yes-no interrogative and the preceding L* pitch accent in the final phrase can be determined by OCP-respecting default, as shown in (19b):

(19)	PF (morphosyntactic interface)	PR (surface phonological representation)
a.	$[[\ldots\ldots]_{InflP}[\,^{L}\,]_{DECL}]_{ForceP}$	$(\ldots\ (\Delta^{H}\ldots\ \mu^{L})_{\varphi})_{IP}$
b.	$[[\ldots\ldots]_{InflP}[\,^{HL}\,]_{QUES}]_{ForceP}$	$(\ldots\ (\Delta^{L}\ldots\ \mu^{HL})_{\varphi})_{IP}$

In other words, I am suggesting that the illocutionary tonal morphemes in Bengali consist only of boundary tones, as is the case in many tone languages, for example. In the interface PF representation, these illocutionary morphemes are the functional heads of a syntactic projection that, following Rizzi 1997, will be referred to as a Force Phrase. In the surface phonological representation PR, the presence of the default pitch accent is determined by Assoc (ΔMaP, Tone) and the quality of the pitch accent tone is determined by the quality of the illocutionary force morpheme and the OCP:

(20)

Declarative: $[\ldots\ldots[anlam]_V\ ]_{InflP}[\ ^{L}\ ]_{DECL}\ ]_{ForceP}$	Realize $[L]_{DECL}$	Realize $[HL]_{QUES}$	OCP	Assoc (ΔMaP, T)	*Tone
⇒ H* [L] a. (…… (**a**nlam)$_{MaP}$)$_{IP}$					**
L* [H] b. . (…… (**a**nlam)$_{MaP}$)$_{IP}$	*!				**
L* [L] c. . (…… (**a**nlam)$_{MaP}$)$_{IP}$			*!		**
[L] d. . (…… (**a**nlam)$_{MaP}$)$_{IP}$				*!	*
Interrogative $[\ldots\ldots[anlam]_V]_{InflP}[\ ^{HL}\ ]_{QUES}\ ]_{ForceP}$					
⇒ L* [HL] a. (…… (**a**nlam)$_{MaP}$)$_{IP}$					***
H* [L] b. . (…… (**a**nlam)$_{MaP}$)$_{IP}$		*!			**
H* [HL] c. . (…… (**a**nlam)$_{MaP}$)$_{IP}$			*!		***
[HL] d. . (…… (**a**nlam)$_{MaP}$)$_{IP}$				*!	**

The constraints Realize $[L]_{DECL}$ and Realize $[HL]_{QUES}$ mentioned in the tableau assure that the tones of a tonal morpheme in the input are maintained in the output, in the quality specified in the input; these constraints are members of the family of constraints which require that a morpheme have some phonological realization in the output. I will assume that the general character of these Realize constraints for tonal morphemes is as in (21).

(21) **Realize [Tone(s)]$_M$** (= a constraint schema)
The tone(s) of a tonal morpheme $[T_1\ (T_2)]_M$ in the morphosyntactic input representation must be realized as such in the output phonological representation

Together with the OCP, these faithfulness constraints assure that the default pitch accent in the final phrase is the polar opposite of the following lexically specified boundary tone morpheme. So just as the quality of the L* pitch accent in nonfinal phrases is determined by constraint, so is the quality of the pitch accents in the final phrase.

Note that the constraint MaxTone, which calls for an input tone to have a corresponding tone in the output (McCarthy and Prince 1995), cannot be given the function of maintaining the tonal morphemes in the output. Bengali is not a tone language, in which tonal contrasts in morphemes which also have segmental content are preserved on the surface. Rather, assuming Richness of the Base (Prince and Smolensky 1993), *Tone must be ranked above Max Tone in order to ensure that any nonmorphemic tones are eliminated in the output. But *Tone must be ranked below the morpheme realization

constraints of the form Realize $[Tone]_M$. An intonational language, which lacks lexical tone contrasts expected for those found in tonal morphemes, is thus characterized by the ranking Realize $[Tone]_M$ >> *Tone >> MaxTone.

3.1.3 The absence of default edge H in the penultimate phrase in declaratives

A minor ranking adjustment to the constraint system developed so far will allow an account of a further property of declarative intonation. Hayes and Lahiri report that no default peripheral H tone appears on the penultimate phonological phrase in the case of the declarative, as seen in (17) (=(3)). They ascribe this to the OCP, which disallows a H tone sequence consisting of a phrase-final H followed by the pitch accent H* of the declarative. Since, by hypothesis, both of these tones are default, none of the faithfulness constraints seen above can decide which one of the H tones is realized. Rather the ranking of Assoc (ΔMaP, T) and the OCP over Align R (ΔMaP, H) will derive the result that it is the edge tone, not the pitch accent, which fails to appear. In other words, it is more important in Bengali to maintain a pitch accent than to maintain a peripheral tone, when the identical qualities of these would produce an OCP violation. The tableau in (22), which illustrates the analysis, contains a version of sentence (17), which, for the sake of the exposition, lacks the overt subject noun phrase:

(22)

[[□□□□□-□.□□□□□□□-□.□□□□□□□.□□□□□] [□□□□□]] [L]$_{DECL}$]	Realize α	OCP	Assoc (ΔMaP Tone)	Align R (MaP, H)	*Tone
L* H H* [L]$_{DECL}$ a. (□□□□□□.□□□□□□.□□□□□□.□□□□□)(anlam))		*!			****
L* H [L]$_{DECL}$ b. (□□□□□□.□□□□□□.□□□□□□.□□□□□)(anlam))			*!		***
⇒ L* ø H* [L]$_{DECL}$ c. (□□□□□□.□□□□□□.□□□□□□.□□□□□)(anlam))				*	***
H* L H* [L]$_{DECL}$ d. (□□□□□□.□□□□□□.□□□□□□.□□□□□)(anlam))				*	****!

The optimal candidate c. shows a violation of the constraint Align R (MaP, Tone); the ranking of this constraint below the OCP and the Assoc (ΔMaP, Tone) allows for this candidate to emerge as the winner. Candidate c. shares an Align R (MaP, H) violation with the nonoptimal candidate d, because both the absence of a H tone and the appearance of a L tone instead of H constitute violations of this constraint. Candidate d. is therefore ruled out by its greater number of violations of the structure-minimizing constraint *Tone. No higher ranked constraint calls for the presence of a default peripheral L at the edge of major phrase, so *Tone rules it out.

3.1.4 The absence of default edge H in the final phrase in declaratives

There is one last property of the tonal patterns of the *final* phrase that remains to be explained, namely the absence of the default H right edge tone that is normally found in nonfinal phrases (except, of course, for the case just described). The default peripheral H tone simply does not appear preceding the L boundary tone of the declarative, as shown in (23a). As for the interrogative, which ends in a [HL] tonal morpheme, as in (18), there is no way of telling whether the default peripheral H tone is present as well.

(23) Neutral focus declaratives lack a phrase-peripheral High tone in the final phrase:

		H* [L]	
a.	ok	…….. (Δ….. μ)$_{MaP}$)$_{IP}$	
		L* H[L]	
b.	*	…….. (Δ….. μ)$_{MaP}$)$_{IP}$	

If the default H were to surface, the tonal pattern to be predicted by the OCP would be identical to that found in interrogatives, namely a L* pitch accent followed by a HL boundary sequence, as in (23b). Homophony avoidance is transparently not a factor in ruling out this candidate for the declarative pattern, however, since homophony of distinct sentence types is not avoided in Bengali. As we will see below, a declarative with a contrastive FOCUS in the final phrase has exactly the L* HL pitch pattern found in the interrogative. Rather, the impossibility of the pattern in (23b) is analyzable as a consequence of the constraint system. Basically, the proposal is that the tonal alignment constraint Align R (MaP, H), which is violated in the optimal candidate (17), is dominated by the morpheme-specific alignment constraint Align R ([L]$_{DECL}$, IP) and the well-known tonal markedness constraint *Contour Tone. (24) gives the ranking that will derive the absence of the default peripheral H tone in the final phrase and (25) is the tableau that shows it. (The pitch accents of the final phrase are not shown in the schematic phrase-final representations in (25).)

(24) Realize [L]$_{DECL}$, Align R ([L]$_{DECL}$, IP), *Contour Tone >> Align R (MaP, H) >> *Tone

(25)

…. [anlam]] [^{L}]$_{DECL}$]$_{FroP}$	Realize [L]$_{DECL}$	Align R ([L]$_{DECL}$, IP),	*Contour Tone	Align R (MaP, H)	*Tone
H a. …. (…μ μ)$_{MaP}$)$_{IP}$	*!				*
[H] b. …. (…μ μ)$_{MaP}$)$_{IP}$	*!				*
[L] H c. …. (…μ μ)$_{MaP}$)$_{IP}$		*!			**
H[L] d. …. (…μ μ)$_{MaP}$)$_{IP}$			*!		**
H [L] e. …. (…μ μ)$_{MaP}$)$_{IP}$				*	**!
⇒ [L] f. … . (…μ μ)$_{MaP}$)$_{IP}$				*	*

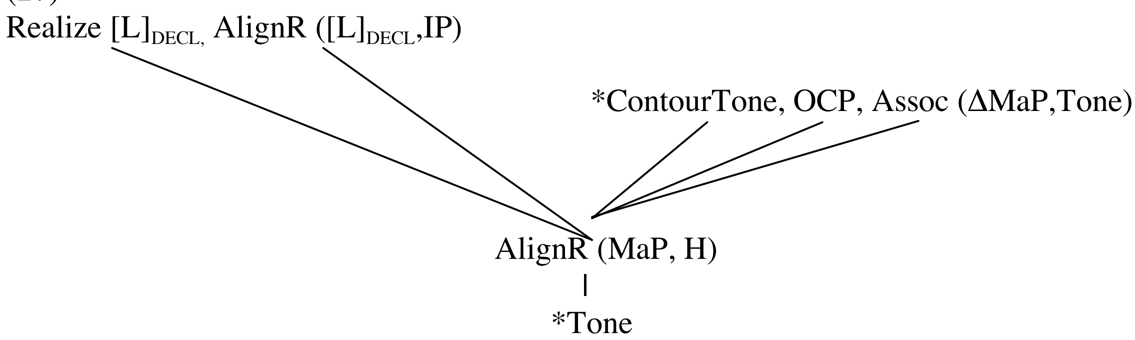
Candidate f., with its simple declarative [L] morpheme, is the optimal one. It violates Align R (MaP, H), but does not show the violations of the higher ranked constraints seen in candidates a.- d., and has fewer violations of *Tone than candidate e. has. The constraint *Contour Tone introduced here is a tonal markedness constraint familiar from much previous research. Its essential role is to disallow the case where both the peripheral default H and the tonal morpheme [L]$_{DECL}$ are associated to the same tone-bearing unit, i.e. the same mora. As for the constraint Align R ([L]$_{DECL}$, IP), it has the function of ruling out candidate c. in this tableau, in which the declarative morpheme is associated to the penultimate mora of the phrase rather that to the edge mora, to which the default H edge tone is associated here. Morpheme-specific subcategorizational alignment constraints like Align R ([L]$_{DECL}$, IP) are made explicit or presupposed in the the literature (Gussenhoven 2000 , Grice et al 2000), where they are given the function of linearizing tonal morphemes within the prosodic representation.

(26) **Align R ([L]$_{DECL}$, IP)**
Align [L]$_{DECL}$ with the rightmost tone-bearing unit of an Intonational Phrase.

Note that an alternative analysis based on the metathesis-banning input-output correspondence constraint Linearity (McCarthy and Prince 1995) cannot do the job of ruling out candidate c., since the H, as a default tone, is not in the input representation, and so its position with respect to input tones is not regulated by the constraint.

This completes my constraint-based analysis of the tonal contours found in declarative and interrogative sentence types under conditions of neutral focus. The full constraint ranking motivated so far, (27), shows the role for totally familiar types of constraints from the tonal and intonational literature in accounting for neutral intonation in Bengali.

(27)



In the next section an analysis of tonal contours in sentences with contrastive FOCUS will be provided which draws on this constraint ranking and adds to it just the constraints relevant to realizing and linearizing the FOCUS morpheme, namely Realize $[H]_{FOC}$ and Align R ($[H]_{FOC}$, MaP).

3.2 The intonation of sentences with contrastive FOCUS

A declarative sentence containing a FOCUS constituent lacks the H* L_I contour of the basic declarative. Instead what one finds in the FOCUS declarative is a final contour consisting of a L* pitch accent followed by a H peripheral tone followed by the L peripheral tone of the declarative morpheme. There are two cases to distinguish:

(28) FOCUS constituent is final in the declarative sentence (on the verb)

L*H_P L* H_P L* ***H*** [L]
(ami) (□□□□□□□□□□□□□□□□□□□□□□□) (□□□□□□)
I king's pictures for money GAVE

(29) FOCUS constituent is not final in the declarative sentence

L* H_P L* ***H*** [L]
(□□□□□□□□□□) (□□□□□□□). □□□□□□□□□□□□□□□□□)
I king's PICTURES for money gave.

The H peripheral tone of a FOCUS, marked in bold italics, always flanks the right edge of the morphosyntactic FOCUS constituent and so differs in its distribution from the declarative morpheme [L], which is confined to the right edge of the sentence. If the FOCUS constituent is not final in the sentence, the H appears at its non-final right edge, at a distance from the L tone at sentence end.

3.2.1 Final FOCUS

Let's review the Hayes and Lahiri argument that the H tone appearing with final FOCUS in declaratives is a morpheme, rather than merely the default H peripheral tone seen in

nonfinal phonological phrases. Hayes and Lahiri base the argument on the contrast between the final tonal patterns of nonFOCUS declaratives like (17) and FOCUS declaratives like (28). The contrast is not in the final L tone, which is common to both forms of the declarative. The contrast is also not in the tonal value of the pitch accents, which are predictable on the basis of the quality of the following peripheral tone. It is the *presence* of the peripheral H tone in final FOCUS declaratives like (28) which is contrastive. That peripheral H in (28) must be morphemic. As we saw above, it cannot be an instance of the default peripheral H tone, which simply fails to appear in nonFocus declaratives like (17). So we must posit a FOCUS tonal morpheme--$[H]_{FOC}$, an entity whose presence in the representation can be assured by a morpheme-realization constraint. As we will see, it is this morphemic status which permits an explanation for the distribution of this H tone in (28) and (29), and for the appearance of the right edge of phonological phrase at the right edge of the FOCUS constituent.

A contour tone consisting of the $[H]_{FOC}$ morpheme and the $[L]_{DECL}$ morpheme is formed at sentence edge in the final FOCUS case. The simple presence of these tones in the representation is guaranteed by morpheme realization constraints, but faithfulness does not guarantee the joint positioning of the tonal morphemes at the right extreme of the utterance, in violation of *Contour Tone. The creation of the contour tone must be forced by constraints requiring that these morphemes appear at a phrase edge. Such an alignment constraint was proposed above for the declarative morpheme, namely (26), Align R ($[L]_{DECL}$, IP). For the FOCUS morpheme, the constraint should be formulated as an alignment with the edge of a phonological phrase:

(30) **Align R ($[H]_{FOC}$, MaP)**
Align $[H]_{FOC}$ with the rightmost tone-bearing unit of a Major Phrase.

The ranking above *Contour Tone of these two morpheme-specific alignment constraints in (31) explains why they form an illicit contour at phrase edge, as we see in tableau (33).

(31) Realize $[H]_{FOC}$, Realize $[L]_{DECL}$, Align R ($[H]_{FOC}$, MaP), Align R ($[L]_{DECL}$, IP) >> *Contour Tone

(32)

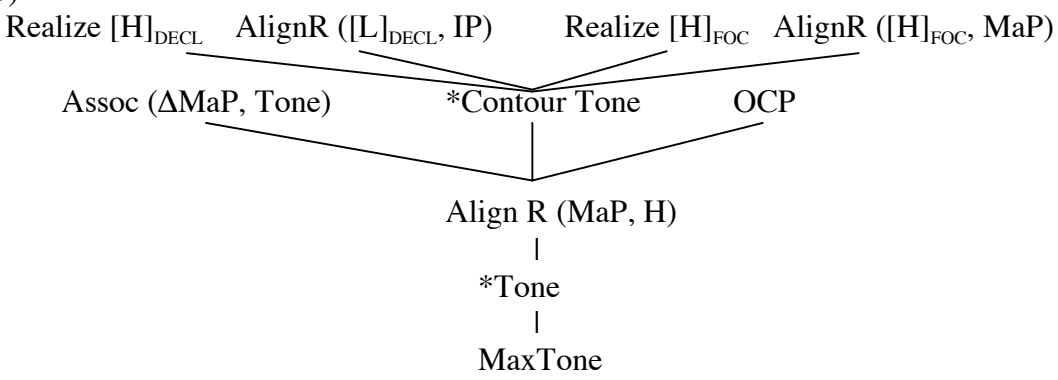
... [anlam] $[^{H}]_{FOC}$ $[\ ^{L}]_{DECL}$ $]_{FroP}$	Realize $[L]_{DECL}$	Realize $[H]_{FOC}$	Align R ($[H]_{FOC}$, MaP)	Align R ($[L]_{DECL}$, IP)	*Contour Tone
[H][L] ⇒ a. …. (…μ μ)$_{MaP}$)$_{IP}$					*
[H] b. …. (…μ μ)$_{MaP}$)$_{IP}$	*!				
[L] c. …. (…μ μ)$_{MaP}$)$_{IP}$		*!			

[H][L] d. …. (…μ μ)$_{MaP}$)$_{IP}$			*!		

Note that this analysis assumes that the alignment constraints for both [H] and [L] tonal morphemes are satisfied by an association to the final tone-bearing unit of the phrase, as seen in candidate a. In other words, the [H] in the optimal candidate a. is considered to be right-aligned even if it precedes the [L] within the phrase. Candidate d. shows a real misalignment of the [H], however, in being associated to the penultimate mora. In candidates b. and c., it is the disappearance of the input tonal morphemes, in violation of the morpheme realization constraints, which accounts for the ungrammaticality of the forms. What we don't yet have an explanation for is the ungrammaticality of an additional candidate where the order of the morphemes in the final contour tone is simply the opposite of what we see in candidate a. Some additional principle would required to account for the optimality of candidate a over this alternative. In the spirit of Pierrehumbert and Beckman 1988, one might assume that an IP-aligned edge tone must lie outside a MaP-aligned edge tone. But there is also a possible explanation based on the positioning of these tonal morphemes in the morphosyntactic structure, where the sentence-peripheral [L] declarative tone lies higher up and to the right of the focus [H] tone, which marks a constituent lower down in the sentence.

To sum up, the two morpheme-specific constraints for the FOCUS morpheme-- Realize [H]$_{FOC}$ and AlignR ([H]$_{FOC}$, MaP)-- have been brought into play in this section and the constraint ranking has been refined. The full constraint ranking is now as in (33).

(33)



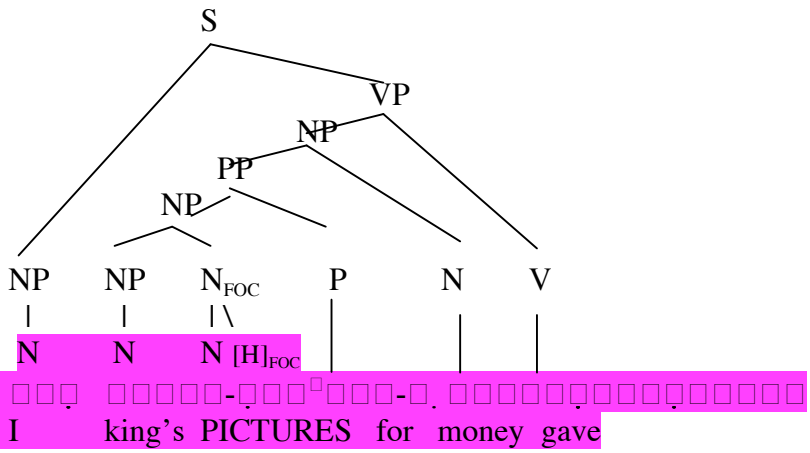
In the next section we will see that the constraints motivated here will also enable us to account for the characteristic tone and phrasing properties of nonfinal FOCUS in Bengali.

3.2.2 Nonfinal FOCUS

Now we are at the point where we can understand the apparently problematic fact with which this paper began, namely the fact that a FOCUS is always flanked by a MaP edge on its right, even when it is not final in the sentence. Sentence (2), repeated here in (34), contains an example of a non-final FOCUS. The interface syntactic representation is (35).

(34) L* H L* H L_I
((□□□□□□□□□) (□□□□□□□) □□□□□□□□□□□□□□□)$_{IP}$

(35)



' I gave money for the king's pictures'

What immediately meets the eye (and ear), is that the right edge of the nonfinalFOCUS constituent is marked by a H tone. We must presume that this is the same focus morpheme $[H]_{FOC}$ that is observed when the FOCUS is final in the sentence. For explicitness, let's take the FOCUS morpheme to be adjoined as a suffix to a word (as in (35)) or a larger phrase, where it licenses the FOCUS property on the dominating node, which in turn gets interpreted as FOCUS in the semantics. Given the position of the $[H]_{FOC}$ morpheme as a suffix of the FOCUS constituent in the syntax, the interface and markedness constraints in (33) will guarantee that in the phonological representation of the sentence the right edge of the FOCUS constiuent will correspond to the right edge of a major phrase in the declarative case given in (34). The constraint AlignR ($[H]_{FOC}$, MaP) plays a crucial role in deriving this result.

The analysis goes as follows. The FOCUS morpheme $[H]_{FOC}$ is forced by faithfulness to the syntactic representation (call this "Syntax Faith" for short) to remain in its syntactically specified position as a suffix at the right edge of the FOCUS constituent. Confined to that position, the FOCUS morpheme is nonetheless required to satisfy its own morpheme-specific interface alignment constraint, AlignR ($[H]_{FOC}$, MaP), which calls for the morpheme to appear at the right edge of a major phrase in phonological representation. Since the position of the $[H]_{FOC}$ is fixed by the syntax in a context in which the right edge of phonological phrase may not be called for, satisfaction of the alignment constraint may require that the phrase edge be introduced into the representation. In other words, AlignR ($[H]_{FOC}$, MaP) may in effect induce the presence of the phrase edge. This is the case in (34)/(35), as seen in (36):

(36) **Nonfinal FOCUS in the declarative**

[[□□□□□-r□□□□ □□□□ [H]FOC-r] □□□□□□ □□□□□□ □□□□□□□□□□ [L]DECL]	Syntax Faith	AlignR ([H]FOC, MaP)	AlignR (MaP, IP)	Exh (IP)
⇒ a. (….. (□□ □□□□)MaP □□□□□□ □□□□ □□□□□□) L* [H]FOC [L]DECL				*
b. (….. (□□ □□□□ □□□□□□ □□□□ □□□□□□)MaP)IP L*[H]FOC [L]DECL		*!		
c. (…… (□□ □□□□ □□□□□□□ □□□□ □□□□□□)MaP)IP L* [H][L]	*!			
d. (….. (□□ □□□□)MaP (□□□□□□ □□□□□)MaP (anlam)MaP)IP L* [H]FOC L* H* [L]DECL			*!	

Candidate c. moves the $[H]_{FOC}$ to coincide with a MaP edge at the end of the sentence, and so violates Syntax Faith. Candidate b. lacks a right edge of MaP at the $[H]_{FOC}$ *in situ* position, and so violates AlignR($[H]_{FOC}$,MaP). Candidate a., which respects both these constraints, is the optimal one. As for candidate d., it contains the phonological phrase edge that is otherwise always present at the left edge of the verb, as well as the edge induced by the FOCUS morpheme, all organized into a prosodic structure respecting Exhaustivity. But, as was proposed in section 2, this post-FOCUS phrasing is ruled out by the markedness constraint which aligns the head MaP with the right edge of IP. The optimal candidate a. lacks any Major Phrase intervening between the head MaP of the FOCUS and the end of the sentence, and so is not considered to count as a violation of AlignR (MaP, IP). It does show a violation of the lower ranked constraint Exhaustivity (IP) (Selkirk 1995), which requires the Intonational Phrase to immediately dominate only major phrases, i.e. constiuent s at the next level down in the prosodic hierarchy.

So this, then, is the explanation for the presence of the right edge of phonological phrase at the right edge of a nonfinal FOCUS constituent in Bengali. The FOCUS morpheme, through its own, independently motivated, subcategorizational prosodic alignment constraint AlignR ($[H]_{FOC}$, MaP), induces the presence of the phrase edge observed. This means that there is no reason to follow Hayes and Lahiri in positing a FOCUS-prosody interface constraint which aligns the right edge of a FOCUS syntactic constituent with the right edge of phonological phrase. The Hayes and Lahiri analysis is incompatible with the Focus Prominence theory of the interface of focus and phonology, so it is a welcome result that there is an alternative to that theory which falls out from the independently motivated analysis of Bengali intonation that has been proposed here.

While the current proposal might be preferable on the grounds of theoretical economy, given that it successfully excludes the class of Focus-Phrasing interface alignment constraints from universal grammar, it would desirable to clinch the case on the basis of empirical fact. Fortunately, the facts are in principle available, though they have not yet been investigated. In a current collaborative project with Aditi Lahiri, we hope to bring the facts to light.

The theory proposed here predicts that if the $[H]_{FOC}$ morpheme is for some reason absent at the right edge of a FOCUS constituent in surface representation, there should be no right edge of phonological phrase at that location. The Hayes and Lahiri theory predicts on the other hand that, regardless of the presence or absence of the FOCUS morpheme, a phonological phrase edge should appear at the right edge of a syntactic FOCUS constituent. Now there happens to be a case of nonfinal FOCUS in Bengali where the $[H]_{FOC}$ morpheme fails to be realized in the output. This occurs in interrogatives, where <H> indicates the deleted FOCUS [H] tone:

(37) L* H L*<H> $[HL]_{QUES}$
(□□□□□□□□□) (□□□□□□□□□□□□□□□□□□□□)
I king's PICTURES for money gave.
'Did I give money for the $PICTURES_{FOC}$ of the king?

The tonal morpheme for interrogatives is $[HL]_{QUES}$, and, as Hayes and Lahiri point out, the absence of the FOCUS morpheme $[H]_{FOC}$ at the right edge of the FOCUS constituent could be attributed to the OCP. Given the Hayes and Lahiri analysis of FOCUS phrasing, there are no implications of this tonal deletion for the phrasing. But in the analysis of Bengali intonation that I have proposed, the loss of the tonal morpheme implies an absence of phonological phrase edge at the right edge of the FOCUS constituent, since there is no other constraint that would produce that phrasing. Now it turns out that there is a way of probing this difference in phrasing predictions in Bengali.

As Hayes and Lahiri demonstrate with admirable systematicity, the phonological phrase organization of Bengali is reflected not just in the patterning of tones within the sentence, but also in the segmental phonology. Interword assimilations like the complete assimilation of final *r* to a word-initial coronal are found within the phonological phrase, but are blocked at phrase edges. So, for example, the sequence /□□□□□□□□□□/ is differently realized in sentences (2) and (3). In (3) where the sequence is phrase-internal, the /□□□/ sequence is realized on the surface as [□□ □□], while in (2), where the first word is a FOCUS and followed by a phonological phrase edge marked by the [H] focus morpheme, the sequence remains unchanged. Segmental assimilation patterns thus provide a means of diagnosing the presence of phonological phrase edges independent of tone, and it turns out that they may choose between my theory of the appearance of phonological phrase edge at FOCUS right edge and the one proposed by Hayes and Lahiri. My analysis predicts that there should be assimilation in the sequence /□□□/in (37), since the sequence is phrase-internal. Hayes and Lahiri predict that assimilation should be blocked, since they posit a phrase edge there even in the absence of [H]. The assimilation facts for this case are not reported in Hayes and Lahiri 1991, and are

unavailable to me at this writing, but hopefully will emerge soon from joint investigation of such cases planned currently planned.

I want to complete this section by showing just how it is that my analysis will select the representation in (37) as optimal for a case of nonfinal FOCUS in an interrogative sentence. The input representation for (37) contains two tonal morphemes—$[H]_{FOC}$ and $[HL]_{Ques}$. If the nonrealization of the $[H]_{FOC}$ morpheme is the consequence of the OCP, then it must be the case that both the OCP and the constraint Realize $[HL]_{QUES}$ dominate the constraint Realize $[H]_{Foc}$, which is violated in the representation, as in (38). The tableau in (39) illustrates the analysis.

(38) Realize $[HL]_{QUES}$, OCP >> Realize $[H]_{FOC}$

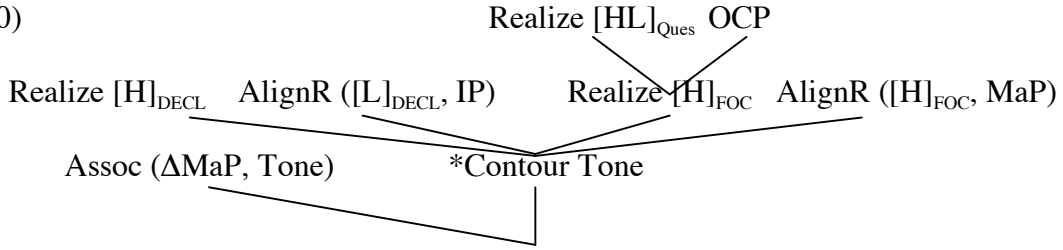
(39) **Nonfinal FOCUS in the interrogative**

[….. [….. [[□□□□□□] [^{H}]$_{FOC}$-r] …..] [^{HL}]$_{QUES}$]	OCP	Realize $[HL]_{QUES}$	Realize $[H]_{FOC}$	AlignR ($[H]_{FOC}$,,MaP)	Exh (IP)
L* $[H]_{FOC}$ $[HL]_{Ques}$ a. (….. (□□□□□□)$_{MaP}$ …..)$_{IP}$	*!				*
L* $[H]_{FOC}$ b. (….. (□□□□□□)$_{MaP}$ …..)$_{IP}$		*!			*
L* $[H]_{FOC}$ $[L]_{QUES}$ c. (….. (□□□□□□)$_{MaP}$ …..)$_{IP}$		*!			*
⇒ L* $[HL]_{QUES}$ d. (….. (□□□□□□ …..)$_{MaP}$)$_{IP}$			*		
L* $[HL]_{QUES}$ e. (….. (□□□□□□)$_{MaP}$ …..)$_{IP}$			*		*!

The optimal candidate d. lacks the FOCUS morpheme, and in so doing respects the higher ranked OCP and Realize $[HL]_{QUES}$, while incurring a violation of Realize $[H]_{FOC}$. In this optimal candidate, there is no phrase edge at the right of the FOCUS since there is no $[H]_{FOC}$ to require it. Note that candidate e. has the same tones as the optimal d. but differs in having a phrase edge present at the right edge of the FOCUS. In this particular case a phrase edge in that medial position would be ruled out by the constraint Exhaustivity (IP), since the stretch between the major phrase it demarcates and the end of the intonation phrase is not itself parsed into major phrase.

Observe that the new ranking in (38) is consistent with the other rankings motivated above for Bengali tonology. (40) is the summary ranking in (33), modified in virtue of (38). Here the OCP is promoted from the lower rank it had been given in (33) for want of any further evidence.

(40)



Align R (MaP, H)
|
*Tone
|
MaxTone

The claim embodied by exploiting a tonal grammar of this sort is that the tonal/intonational patterns of sentences—in any language-- must be seen as deriving from the interaction of different types of constraints, including morpheme-specific realization and alignment constraints, generic faithfulness constraints like MaxTone, prosodic enhancement constraints calling for (default) pitch accent or edge tones, and classic tonal markedness constraints like the OCP and *Contour Tone. Of course these tonal constraints interact with the constraints of the grammar which define the prosodic structure of sentences. They may either collaborate within a prosodic structure that is independently defined, or, as in the case of the morpheme-specific constraint AlignR ($[H]_{FOC}$, MaP), may in fact be responsible for the presence of some aspect of prosodic structure.

4. Summary

In the early sections of the paper, I sketched out a theory of Bengali FOCUS-related phrasing that would be consistent with the Focus Prominence hypothesis, and in the last section this theory was further fleshed out, and shown to be viable. To summarize, the constraints and rankings crucially involved in the analysis of Bengali FOCUS phrasing patterns are:

(i) The FOCUS-Prominence interface constraint: FOCUS (α) $\subset$ ΔIP

(ii) Phonological markedness constraints of the prosodic prominence-prosodic edge alignment family:
-- AlignL (PWd, MaP)
-- AlignR (MaP, IP)

(iii) The ranking hierarchy FOC-Prom, AlignR (PWd, MaP) >> $*Struc_{MaP}$
(collectively responsible for the phrase edge at the left of FOCUS)

(iv) The morpheme-specific alignment constraint AlignR ($[H]_{FOC}$, MaP)
(responsible for the presence of phrase edge at the right of FOCUS)

(v) The ranking hierarchy
FOC Prom, AlignR (MaP, IP), AlignR ($[H]_{FOC}$, MaP) >> Exh (IP)
(collectively responsible for absence of phrasing to the right of the FOCUS phrase)

The FOCUS-Prominence interface constraint makes appeal to the FOCUS properties of syntactic constituents in the interface representation, and is seconded in producing its prosodic phrasing consequences by familiar prosodic markedness constraints, as proposed by Truckenbrodt 1995. The additional right-edge phrasing effect in Bengali is produced by a constraint which calls on a specific morpheme in the interface syntactic representation to be aligned with a prosodic phrase edge in phonological representation,

namely AlignR ($[H]_{FOC}$, MaP) . The existence of this latter sort of constraint, which relates the FOCUS morpheme to prosodic phrasing, is consistent with the Focus Prominence theory of the focus-phonology interface. Focus Prominence theory does not exclude subcategorizational constraints that are restricted to specific morphemes like the FOCUS morpheme. The theory limits only the nature of interface constraints which appeal to the semantically interpreted focus feature marking of higher order constituents in the syntactic representation. This focus marking of higher order constituents may of course be projected from focus morphemes like that in Bengali, but the morpheme itself is not a focus(sed) constituent in this sense. The facts of Bengali focus intonation therefore do not challenge the hypothesis that the only focus-phonology interface constraints in a grammar are those which relate focus-marked constituents of surface PF to prosodic stress prominence in surface PR.

The Hayes and Lahiri claim for the centrality of the OCP is supported in the present optimality theoretic analysis, which relies on the OCP for an explanation of the polar character of pitch accents and following peripheral tones within a phrase, as well as for an explanation of the absence of peripheral tones (whether default tone or underlying tonal morpheme) when a following tone (whether default pitch accent or underlying boundary tone morpheme) would be of identical tone quality. This long-distance application of the OCP, between tones of disparate provenance and surface association type is noteworthy, and demands notice in a typology of possible conditions of OCP application across languages. In the particular case of Bengali, assuming that the OCP governs possible output representations has permitted a pared down theory of what the tonal morphemes of Bengali are in the first place, restricting them in this language to sentence-final morphemes, as in the case of the declarative [L] and interrogative [HL] illocutionary force morphemes, or to the constituent-final [H] FOCUS morpheme. All other tones in Bengali intonation are analyzable as default tones, whose presence, and quality, is determined by phonological markedness constraints.

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[1] $[H^*+L]_{FOC}$ pitch accent in European Portuguese(Frota 2000), $[H]_{FOC}$ phrase-edge tone in Bengali (Hayes and Lahiri 1991), $[H]_{FOC}$ accent-tropic tone in Swedish (Bruce 1977)
[2] Selkirk 1984, 1995 proposes that pitch accents are a default reflex of the presentational Focus status of a word in English. Selkirk 2002 suggests that it is the L+H* which appears by default with contrastive FOCUS .
[3] Hungarian (Vogel and Kenesei 1987), Japanese (Pierrehumbert and Beckman 1988), Chichewa (Kanerva 1989), Shanghai Chinese (Selkirk and Shen 1990), and others
[4] Jackendoff 1972, Hayes and Lahiri 1991, Reinhart 1995, Roberts 1996
[5] Pierrehumbert and Beckman 1988, Inkelas and Leben 1990
[6] European Portuguese (Frota 2000)
[7] Note than I am not saying that there are no alignment constraints at all which characterize the syntax-phonology interface. Indeed, there is evidence that, independent of focus, you do need interface constraints aligning the edges of syntactic constituents defined in X-bar level terms with prosodic constituents at a designated level, e.g. Align R/L (XP, MaP) (see Selkirk 1986 et seq, Nespor and Vogel 1986, Chen 1987, Truckenbrodt 1998, Sugahara 2003, among others).
[8] The position of the verb in the surface representation of these sentences is particularly in need of clarification. Given the structure in (1), there can be no principled explanation for the systematic appearance of a phonological phrase break at the left edge of the verb, seen in nonFOCUS sentences such as (3). But since this aspect of Bengali phonological phrasing is not of immediate concern, I will continue to assume the structure in (1). It at least shows the analysis in terms of noun phrases that will survive regardless of the ultimate decision about their position in a higher order syntactic structure.
[9] For example, in some languages with lexical pitch accent, words lacking pitch accents in their input form receive a default pitch accent on the main stressed syllable of the output form. See Zec 1999 on Serbo-Croatian, Lahiri 2002 on Swedish .
[10] Beginning with the analysis of "initial lowering" in Japanese as an alignment of L and H peripheral tones (Poser 1984, Pierehumbert and Beckman 1988), there have been a variety of languages analyzed as showing default, constraint-introduced edge tones, including the medial MaP-edge L phrase tone of English (Selkirk 2000), the LH phrase edge tone of Korean (Jun 1993), etc.

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