

Comments on Intonational Phrasing in English

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The Intonational Phrase organization of a sentence is a hybrid beast. It sometimes shows a tight correlation with the semantic properties of the sentence, namely what the sentence means in standard truth conditional terms. It sometimes appears to be a reflex of the Focus structure of the sentence. Sometimes it appears to be correlated with the length of the constituents of a sentence. And sometimes it seems merely to reflect a stylistic option in the utterance of a sentence. This paper centers on the ways in which intonational phrasing in phonological representation is dependent on the properties of the interface syntactic representation, giving but a nod to other factors. It assumes a grammatical architecture in which syntax mediates between phonology and semantics and where the syntax-phonology interface is characterized in terms of a set of optimality theoretic interface constraints (cf. Selkirk 1995, Truckenbrodt 1999).

1. Prosodic properties of Intonational Phrase in English

Bing 1979 and Nespor and Vogel 1986, following Downing 1970 (following Emonds 1970), propose that a root sentence in syntactic representation corresponds to an Intonational Phrase (IP) in the interface phonological representation. Emonds 1970, 1976 defines a root S (“sentence”) as an S that is not dominated by a node other than S. (Current theories of sentential projections would call for a new definition; see below.) Emonds and Downing propose to account for “comma intonation” through a constraint requiring that “A root S (immediately) dominated by another S is set off by commas (Emonds 1976, 43)”. Following Nespor and Vogel 1986, I will assume that this correspondence between root S and “comma intonation” is reflected in the different Intonational Phrase parses available for the conjoined sentences in (1) and (2), for example. In (1), Billy had a false belief. In (2) Billy believed a conjunction of two different things.

- (1) a. [Billy thought his father was a merchant]_{Root}, [and his father was a secret agent]_{Root}
b. _{IP}(Billy thought his father was a merchant)_{IP} _{IP}(and his father was a secret agent)_{IP}
vs.
- (2) a. [Billy thought [his father was a merchant and his mother was a secret agent]]_{Root}
b. _{IP}(Billy thought his father was a merchant and his mother was a secret agent)_{IP}

(Downing 1970, cited in Nespor & Vogel 1986)

The different IP parsings assigned to these sentences are reflected in yet further phonological and phonetic properties of these contrasting prosodic structures.

In (1) we have an instance of the conjunction of two root sentences. At the right of the first conjoined root sentence, two distinctive properties may appear: (i) a “comma pause” or significant elongation, and (ii) a final rising contour (L-H%). (A deep final fall is a possible alternative: L-L%.) In the Pierrehumbert 1980 and ToBI (Beckman and Ayers-Elam 1997) theory of English intonation, assumed here, a two part boundary tone like the L-H% rise (or the L-L%) is possible only at the edge of Intonational Phrase, where a Major Phrase edge is followed by an Intonational Phrase edge. The lower-order Major Phrase (aka intermediate phrase) shows only a simple L- or H- boundary tone. The Intonational Phrase shows an additional L% or H% boundary tone. As is fairly standard for English I will use the availability of a continuation rise L-H% as a sign of Intonational Phrase edge status, since the fall-rise pitch contour produced in conjunction with the default H* pitch accent on a preceding word, namely H*L-H%, is qualitatively distinct from the contour created from the simple fall, H*L-, or level high, H*H-, that would be found at the end of a Major Phrase after H*. In (1), then, which can have a continuation rise at the end of the first conjunct, we have an analysis into a succession of two IPs. As for the temporal disjuncture to be found at IP edge (the “comma pause”), it is greater than that to be found at a MaP edge (Beckman and Edwards 1990, Beckman and Ayers-Elam 1997). The ToBI system of temporal boundary indices calls for a size “3” boundary index after a MaP (aka intermediate phrase) and a size “4” boundary index after an IP.

There is a third prosodic property, involving upward pitch reset at the left edge of a phrase, that appears to distinguish an Intonational Phrase break from a Major Phrase break. Van den Berg, Gussenhoven and Rietveld 1992 observe for Dutch and Truckenbrodt 2002 et seq observes for German that the upward reset of pitch register found at the left edge of an Intonational Phrase goes higher than the pitch reset at the left edge of a mere Major Phrase (which they call Phonological Phrase). Similar observations for English are made by Ladd 1986, 1988. I believe this is true for the cases at hand as well. Specifically, in (1), the pitch register of the second conjoined sentence appears in a higher pitch range with respect to what precedes than it does in (2).

Given this discussion, then, a fuller representation of (1b) including tones (in particular, a medial continuation rise), pause, and a representation of tonal register would be as in (3):

- (3) $IP_{(MaP(Bi^{H*}lly\ thought\ his\ fa^{!H*}\ ther\ was\ a\ me^{!H*}rchant^{L-H\%})_{MaP})IP} //$
 $IP_{(MaP(^{!}and\ his\ fa^{H*}\ ther\ was\ a\ secret\ a^{!H*}gent^{L-L\%})_{MaP})IP}.$

The two carats at the beginning of the second IP indicate the significant upward pitch reset to be found there, undoing the successive downstepping of accents (marked by !H*) that can be found in the preceding clause. The ! following the carats indicates that the pitch reset at the beginning of the second IP does not involve an actual return to the phrasal register of the preceding IP (namely the pitch level of the initial accent of that IP); in other words, there is a (slight) downstep of the starting phrasal register of the second IP with respect to the first (cf. van den Berg et al 1992). As for the //, it indicates the presence of the substantial “comma pause” intervening between the two conjuncts. (In

subsequent sections I will not always include the IP-initial carats representing pitch register or the double lines for pause.)

By contrast, in the pronunciation of (2), corresponding to the meaning where Bill thinks something about both his father and his mother (with conjoined subordinate clauses as the complement of *thought*), these three characteristics are standardly missing. A final continuation rise on *merchant* would disfavor the reading that *Bill thought his mother was a secret agent*; a comma pause in that position would also disfavor that reading. Instead, it seems appropriate to prosodically parse (2) with a smaller level of phrase break after *merchant*, namely a Major Phrase break, as in (4):

- (4) $IP_{MaP}(Bi^{H*}lly\ thought\ his\ fa^{H*}ther\ was\ a\ me^{H*}rchant^{L-})_{MaP}$
 $(\wedge\ and\ his\ mo^{H*}ther\ was\ a\ secret\ a^{H*}gent^{L-L\%})_{MaP}IP.$

The Major Phrase break accounts for the presence of the peripheral L- tone at the right edge of *merchant* as well as for some degree of temporal disjuncture there. And it explains why the upward pitch reset at the left of the second prosodic phrase is less than in (1)/(3). So what these examples show is that conjoined *embedded* sentences will tend *not* to be separated by a “comma intonation”, while sentences conjoined at the *root* sentence level *will*. Supplied with an understanding of the nature of that “comma intonation”, we are in a position to discuss the further circumstances in which it may arise in within sentences.

2. The syntactic grounding of IP

There is an apparent difficulty for the Emondsian root sentence theory of Intonational Phrasing which is posed by the phrases and clauses which Potts 2003, 2005 terms *supplements*. These include “nonrestrictive” relative clauses, appositives, *as*-parentheticals, and any other variety of parenthetical expression. These expressions are generally assumed to be flanked by “comma intonation”, or IP edges (Emonds 1970, 1976, Downing 1973, Bing 1979, Nespor and Vogel 1986, Truckenbrodt 1995, Potts 2002, 2003, 2005.) Yet their status as root sentences is disputable.

A classic instance of these typically comma-flanked expressions are the so-called nonrestrictive relatives, which Potts terms *supplementary relatives*:

- (5) The Romans, who arrived before one hundred AD, found a land of wooded hills.

There are in effect two assertions made by such a sentence: the Romans found a land of wooded hills and they arrived before 100 AD. As Potts points out, one index of the essential independence of the meaning of these parts is shown by the fact that the proposition expressed by the relative clause may be false while the meaning of the containing sentence remains true. The necessity of the phrase breaks cued by the commas in the supplementary relative (5) is revealed by the contrast to (6), where the

absence of substantial phrase breaks after the relative clause and the head DP is accompanied by a semantically distinct, restrictive, interpretation of the relative clause.

(6) The Romans who arrived before one hundred AD found a land of wooded hills.

In this case, if no Romans arrived before 100 AD, the entire sentence lacks a truth value. Nominal appositives like (7) are similarly semantically independent of the surrounding sentence and are set off intonationally, and orthographically with commas, while the integrated nominal appositive analog of a restrictive relative, seen in (8), is not:

(7) My uncle Pliny, the Latin teacher, has been working on his Greek.

(8) Pliny the Elder authored an encyclopedia.

The more general class of parenthetical expressions, which includes the *as*-parentheticals studied by Potts (2002), are also marked by the characteristic comma intonation which we define in terms of intonational phrase.

(9) a. Ames was, as the press reported, a successful spy.

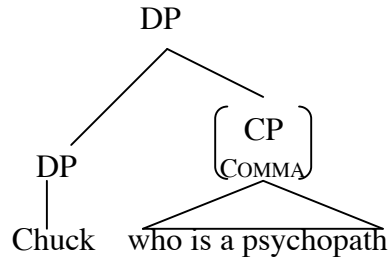
b. I think alpacas, though they're smaller than llamas, can have longer hair.

c. The books, some have claimed, have not arrived yet.

The Emonds 1976 account of the intonational phrasing of the comma-flanked expressions in (5), (7) and (9) understands them to be sentential and immediately dominated by the sentence containing them (hence they are root sentences); others have argued for a syntactic analysis which puts these expressions completely “outside” (though linearized within) the containing sentence (e.g. McCawley 1989), and so makes them root sentences. These syntactic analyses allow the generalization about the relation between syntax and intonational phrasing to be simply that a root sentence in the syntax require the presence of a corresponding intonational phrase in prosodic structure.

Potts 2002, 2003 challenges this view of the syntax of the comma expressions, however, arguing that these expressions appear in routine modifier structures, as adjoined phrases, rather than in positions “outside” the sentence, or as daughter to the root sentence. For example, it's a fact that a supplementary relative clause or a nominal appositive must always be adjacent to the DP upon which it is dependent for its interpretation. Potts argues that this positioning means that the supplement is adjoined to the adjacent DP. What distinguishes these expressions from non-supplementary expressions, proposes Potts, is not a special syntax, but rather a feature [+comma] annotating the syntactic structure. The [+comma] features has an effect on both the phonological and semantic interpretation. He assigns the structures in (10) to supplementary relative clauses:

(10)



Another example of the necessity of positioning supplementary expressions as modifiers within the syntactic structure of the containing sentence is provided by *as*-relatives, studied in Potts 2002. The generalization, Potts claims, is that “*As*-clauses adjoin directly to the linguistic material from which they obtain their meaning.” Compare the following sentences and the notes on their interpretation supplied by Potts.

- (11) Alan claimed that cryptography is a blast, as you mentioned.
- As*-clause = you mentioned that cryptography is a blast
 - As*-clause = you mentioned Alan claimed that cryptography is a blast
- (12) Alan claimed that, as you mentioned, cryptography is a blast.
- As*-clause = you mentioned that cryptography is a blast
 - As*-clause ≠ you mentioned Alan claimed that cryptography is a blast
- (13) As you mentioned, Alan claimed that cryptography is a blast.
- As*-clause ≠ you mentioned that cryptography is a blast
 - As*-clause = you mentioned Alan claimed that cryptography is a blast

(11) is ambiguous in its interpretation, and this is attributable to the two different sites for adjunction of the *as*-clause, either as adjunct to the embedded sentence, or as adjunct to the root sentence. On the other hand, in both (12) and (13) the *as*-clause has only one interpretation, the one that is consistent with the possible adjunction site for it within the sentence, given its positioning. In (12) the *as*-clause, sandwiched in between the *that* complementizer and the following embedded IP is adjunct to that embedded IP, while in (13), the *as*-clause must be an adjunct of the root sentence, which it directly precedes.

So, the argument goes, it is the [+comma] feature associated with supplementary constituents, not their (alleged) status as root or matrix sentences, which is responsible for their special treatment in the grammar. Let’s call a [+comma]-marked constituent of syntactic structure a Comma Phrase, or CommaP. In the semantics, Potts proposes, the effect of [+comma], is to associate the denotation of the marked constituent with the semantic content of a conventional implicature (Grice 1975), which means, among other things, that they are “logically and compositionally independent of ... the at-issue entailments (Potts 2003, 119)” of the proposition expressed by the surrounding sentence. Another way of putting this, according to Potts, is that supplementary expressions are each performed as a separate speech act, one that is independent of the speech act expressed by the containing sentence. In the phonology, Potts suggests, the [+comma]

feature is responsible for the associated “comma intonation” found on a [+comma]-marked constituent.

The generalization up to this point, then, is that root sentences on the one hand and supplementary Comma Phrases on the other both correspond to Intonational Phrase in phonological representation. There is now just a small step needed to unify these cases with a single syntactic/semantic characterization. We need simply assume that Root sentences are, by default, also characterized by the [+comma] feature. This of course makes semantic sense, in that each Root sentence is performed as a separate speech act, and its meaning is independent of the at-issue entailments of any other Root sentence and of any other Comma Phrase. The syntactic grounding for Intonational Phrase is thus simply characterized as the Comma Phrase. Root sentences and supplements form a natural class in that they are both Comma Phrases, and so are performed as distinct speech acts and are set off by Intonational Phrase edges from what surrounds them.

Before examining other syntactic configurations for evidence that Intonational Phrase is syntactically grounded in the Comma Phrase, let’s look at the particular interface constraint which might likely define the relation between these Comma Phrase node and the Intonational Phrase nodes in the respective PF and PR representations of a sentence.

3. The interface constraint for Intonational Phrase

In earlier work, I have argued that the syntax-phonology interface is characterized by a set of demarcative constraints that match up, or *align*, the edge (R or L) of a designated constituent type in the syntax with the edge of a corresponding constituent type in prosodic structure (e.g. Selkirk 1986, 1995). Truckenbrodt 1995, 1999 argues for an additional cohesional, Wrap family of interface constraints, which call for a constituent of a designated type in the syntax to be *contained within* a prosodic constituent of a corresponding type. Collectively this node-correspondence-based theory of the interface can be referred to as the Align/Wrap Theory.

(14) The Align/Wrap Theory of the syntax-phonology interface: constraint schemata

a. **Align R/L** (Σ_i, π_{Σ_i})

Align the R/L edge of a constituent of type Σ_i in syntactic (PF) representation with the R/L edge of a corresponding constituent of type π_{Σ_i} in phonological (PR) representation.

b. **Wrap** (Σ_i, π_{Σ_i})

A constituent of type Σ_i in syntactic (PF) representation (specifically, its terminal string) must be contained within a corresponding constituent of type π_{Σ_i} in phonological representation.

(See section 5 on the notations Σ_i and π_{Σ_i} .) The demarcational Align constraints have been exploited to capture a recurrent *asymmetry* in prosodic phrasing, whereby it is just one of the edges of the designated syntactic constituent in the interface representation which is required to coincide with the edge of the corresponding prosodic constituent. For example, in English in a double-complement Verb-Object-PP sequence, the right edge of the object DP coincides with a Major Phrase edge, but the left edge does not, giving a representation as in (15):

(15) (They issue marriage licenses)_{MaP} (at Town Hall)_{MaP}

For English, then, the inherently asymmetric Align R (XP, MaP) captures this phrasing pattern:

(16) **Align R (XP, MaP)**

Align the right edge of a maximal projection in the interface syntactic representation with the right edge of a Major Phrase (aka Intermediate Phrase) in phonological representation.

Intonational Phrasing in English also reveals an asymmetry in prosodic phrasing, which has not yet been discussed here. When a Comma Phrase is sentence-medial, as in the case of supplementary relatives, appositives and parentheticals, the *right* edge of the Comma Phrase has all the hallmarks of an edge of Intonational Phrase, but the *left* edge of the Comma Phrase often only displays the properties of the edge of a lower order prosodic constituent. An asymmetry of this sort, whose importance for the theory of the syntax-phonology interface is underscored by Taglicht 1996, has been observed by previous scholars of English intonation in the British school, as well as by Bing 1979, Bolinger 1986, and Ladd 1986. Positing the right-edge-alignment constraint for Intonational Phrase in (17) would capture the asymmetry in phrasing:

(17) Interface Constraint for Intonational Phrase in English

Align R (CommaP, IP)

Align the R edge of a constituent of type Comma Phrase in syntactic (PF) representation with the R edge of a corresponding constituent of type π_{CommaP} (=Intonational Phrase, IP) in phonological (PR) representation.

Assuming a syntactic representation for supplementary relatives like that proposed by Potts in (10), the Align R (CommaP, IP) constraint would relate the interface syntactic representation in (18) to the prosodic representation in (19):

(18) [_{DP}[_{DP}[The Romans]_{DP} [who arrived early]_{Comma}]_{DP} [found [a land [of wooded hills]]]]]

(19) $IP((\text{The Ro}^{H*} \text{mans}^{L-})_{MaP} (\text{who arri}^{!H*} \text{ved ea}^{!H*} \text{rly}^{L-H\%})_{MaP})_{IP} // IP((\wedge^! \text{fou}^{H*} \text{nd a la}^{!H*} \text{nd} \dots)_{MaP})_{IP}$

The appearance of an Intonational Phrase break after the CommaP is supported by the possibility of, and even preference for, the continuation rise L-H% at its right edge. The expected temporal disjuncture, the “comma pause,” is also found there. And-- another characteristic trait of parentheticals and the like (cf. Cooper and Sorenson 1981, Kutik et al 1983)-- there is a significant upward pitch reset after the supplementary relative. The reset raises the pitch register of *found* to a level that is slightly downstepped from *Romans*, which initiates the previous IP. This is the amount of partial upset that is predicted by the van den Berg et al 1992 and Truckenbrodt 2002 theory, assuming that a *left* IP edge follows this medial Comma Phrase, as in (19). (Note that, given this theory of pitch range resetting, it is not necessary, contra Ladd 1986, to assume that the pre- and post-parenthetical material of the matrix sentence form part of the same, discontinuous, Intonational Phrase in a recursively embedded IP structure--- (... (parenthetical)_{IP}...)IP-- in order to account for the fact that the pitch range of the second part is only slightly downstepped from that of the first.)

The asymmetry in the phrasing of the supplement is shown by the fact that there is typically no corresponding evidence for an IP break preceding or at the *left* edge of the medial Comma Phrase. A continuation rise is avoided in this position; only a fall, which is representable as pitch accent H* followed by a Major Phrase-level L- boundary tone, is standardly found. A substantial pause is also avoided at this juncture (see Watson and Gibson in press). These facts mean that the pre-supplement sequence does not end in a right IP edge. And the fact that the pitch register on the Comma Phrase is either downstepped (as in this case) or only slightly reset upwards with respect to what precedes, means that the supplement itself does not initiate an IP. These properties suggest that the “head” and the supplementary relative are simply parsed into a sequence of Major Phrases, all contained within the same Intonational Phrase, as represented in (19). As to the question why there should be a MaP break in the first place after the “head” of this “nonrestrictive” relative, I will assume that it is due to the status of the “head” as a maximal projection, XP. In this case, the interface constraint Align R (XP, MaP) will account for the MaP break there (cf. the assumed surface syntactic structure in (10)). It should be mentioned that Ladd 1986 suggests there is also a possible prosodic representation of a sentence like (18) in which there is indeed an IP break separating a parenthetical from what precedes, in other words, that the sequence parsed as the initial MaP in (19) would be parsed as an IP, and the parenthetical supplement would be too. I assume that the availability of this additional parsing is a consequence of the stylistic promotion of MaP to IP (see section 7).

Compare the prosody of the supplementary relative in (19) to that of the restrictive relative of (20) in (21):

(20) [DP[The_{NP}[Romans [who arrived early]]_{NP}]_{DP} [found [a land [of wooded hills]]]]

(21) IP((The Ro^{H*} mans who arri^{H*} ved ea^{H*} rly^L)_{MaP} (^! fou^{H*} nd a la^{H*} nd...)_{MaP})_{IP}

Here there is no tendency for a prosodic phrase break to appear between the head and the relative clause. The absence of a fall to a L- tone on *Romans*, which would be a property

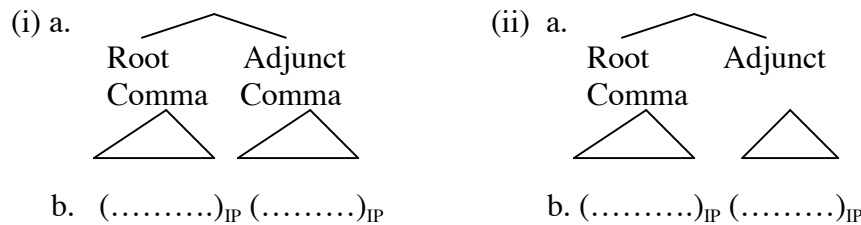
of a MaP edge, can be ascribed to the non-phrasal status of the head itself, which I am assuming here is a simple common noun that is sister to a relative clause modifier in the syntactic representation. As for the right edge of this restrictive relative clause, it does mark the edge of a maximal projection, and is expected to show a MaP edge in phonological representation, since the subject phrase itself constitutes a maximal projection.

In each of these contrasting cases of relative clauses, then, we see evidence for the sort of asymmetry in phrasing that the edge-based alignment theory predicts should be found. The constraint Align R (CommaP, IP) does the work of explaining why a medial supplement expression should end with an IP break, but not begin with one. The constraint Align R (XP, MaP) explains the presence of the MaP at the left edge of the medial CommaP in supplemental relatives, since it happens to coincide with the right edge of an XP, namely the head of the relative clause. The asymmetric XP alignment constraint also explains why a restrictive, non-supplement, relative clause should end with a MaP break, but be separated from its head by no MaP break.

4. The intonational phrasing of right- and left-peripheral sentence adjuncts

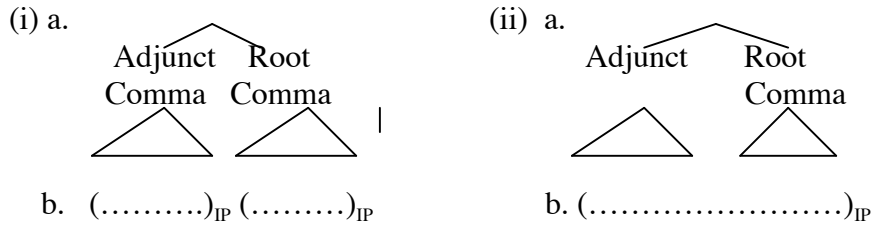
Let's make the assumption that there is indeed some constituent that we can identify as the Comma-marked Root sentence. And let's assume that it may be flanked on its right or its left by a sentence adjunct. And let's assume furthermore that these sentence adjuncts themselves may or may not be marked by the [+comma] feature proposed by Potts. The possibilities are laid out in (22i-ii) and (23i-ii):

(22) Right-peripheral sentence adjuncts and their intonational phrasing



In these right-peripheral adjunct cases, an IP break is predicted to fall at the right edge of the Comma-marked Root sentence, regardless of the Comma-marking of the adjunct. This is due to the formulation of the interface constraint itself: Align R (CommaP, IP) simply calls for an IP edge at the right edge of any root sentence (given our assumption that it is Comma-marked). The situation with left-peripheral adjuncts is different. Here, the presence of an IP break at the left edge of the Root sentence depends on the status of the Adjunct itself, whose right edge will coincide with an IP edge only if it is Comma-marked.

(23) Left-peripheral sentence adjuncts and their intonational phrasing



We are actually not in a position to explore with any certainty the predictions of the theory of the interface constraint for Intonational Phrase proposed above when it comes to sentence adjuncts at the left periphery of the sentence. The possibility that certain sentence adjuncts may themselves qualify as Comma Phrases, with their own conventional implicatures and their own potential for being performed as speech acts, has not yet been fully explored, but see Potts 2003, 2005. Moreover, the appropriate derived syntactic structure for such adjuncts is currently much debated in the syntactic literature. Finally, there is more than one possible reincarnation in current syntactic theory of the notion “root sentence” -- the [+comma]-marked sentence core to be performed as a speech act -- be it CP or Force Phrase (Rizzi 1997). Despite these uncertainties, I would still like to make a preliminary investigation of the sorts of predictions that are made about sentential adjuncts by the theory of the syntax- intonational phrasing interface that is embodied in Align R (CommaP, IP).

Let us first look at the classic case of contrast in the locus of right-peripheral adjunction that is provided by *because* clauses, which may be either VP adjuncts or sentence adjuncts. The Align R (CommaP, IP) theory proposed here predicts that when the *because* clause adjoins to a VP, there will be no IP break required at the adjunction point, since the VP is not itself [+comma]-marked, as in (24). The Comma-marked status of the *because* clause is irrelevant, given this directional formulation of the interface constraint. But when the *because* clause adjoins to the [+comma]-marked root sentence, as in (25), there is predicted to be a parsing of the entire sentence into two Intonational Phrases:

(24) VP Adjunct

- a. Cindy isn't planting a garden because she loves tomatoes.
 [You know very well that she's does it for the flowers, and that tomatoes are only a sideline, i.e. it's not because she loves tomatoes that she's planting a garden.]
- b. ((C^{iH*} ndy isn't pla^{!H*} nting a ga^{!H*} rden^{L-})_{MaP} (becau^{H*} se she lo^{!H*} ves toma^{!H*} toes^{L-L%})_{MaP})_{IP}

(25) Sentence Adjunct

- a. Cindy isn't planting a garden, because she loves tomatoes.
 [She planted tomatoes last year, and thinks that the ground has to lie fallow for a year before she can plant them again.]
- b. (C^{iH*} ndy isn't pla^{!H*} nting a ga^{!H*} rden^{L-H%})_{IP} // (^^becau^{H*} se she lo^{!H*} ves toma^{!H*} toes^{L-L%})_{IP}

The difference in scope of negation in the two cases is tied to the locus of the adjunct clause within the syntactic structure. The *because* clause is outside (specifically, above) the scope of negation in the sentence adjunct case, (25), but under the scope of negation in the VP adjunct case, (24). The location of the adjunct correlates in turn with the prosodic phrasing possibilities and with the consequent contrasts in tonal and temporal properties attested in these two cases. (25), the sentence adjunct case, is analyzed as two Intonational Phrases, with a break between the adjunct and what precedes, because it involves adjunction to the comma-marked Root, as in (24). The “comma pause” disjuncture, the availability of final L-H%, and the significant upward reset on *because* here all testify to the IP break at this location. By contrast, there is no IP break in (24), where the adjunct is VP-adjoined, and hence separated only by a Major Phrase break from what precedes.

The importance of this example lies in the tightness of the correlation between meaning and intonation, and in the simplicity of the explanation for it. When the *because* adjunct attaches to the Root sentence, it is both outside the scope of negation and outside the Intonational Phrase which aligns with the edge of that (Comma-marked) Root sentence. It is the interface constraint Align R (CommaP, IP) which is responsible for the intonational phrasing and attendant prosodic properties in the phonological representation. And it is the simple compositional computation of the semantic interpretation of the sentence that is responsible for the scope of negation facts. More generally, any phrase that is right-adjoined to Root sentence is expected to show the same intervening IP break, due to the right-edge-alignment of CommaP with IP, and to show the semantic reflexes of that peripherality as well.

Another interesting example of the correlation between meaning and intonational phrasing at the right periphery is provided by the contrasting sentences in (26) and (27):

(26) She planned to remain true to herself.
[She planned to continue being true to herself.]

(27) She planned to remain, true to herself.
[(Being) true to herself, she didn't intend to leave.]

In (26) *true to herself* is an adjectival complement of *remain*; the verb and its complement are in the same IP, and the same MaP as well, hence there is no prosodic break between them. In (27) by contrast, *remain* lacks a complement and *true to herself* is a supplementary expression, a Comma Phrase, with what is plausibly an attachment to the Root sentence. (Note the preservation of meaning under left adjunction of the same sentence adjunct.) In this case the appearance of the orthographic comma reflects the presence of the intonational phrase break, which appears because the constraint Align R (CommaP, IP) calls for an IP edge to coincide with the intervening right edge of the root sentence in the syntax.

So what we have seen here is that cases of right adjunction to root sentence involve an Intonational Phrase break, while cases of adjunction to VP do not show an IP break

(cases of immediate complement to the verb show no phase break at all). This pattern of facts supports the theory of asymmetric (right-biased) interface alignment of IP edge with the edge of a [+comma]-marked constituent (given the assumption that the root sentence is [+comma]-marked).

As for the left periphery, expressions to be found there include various sorts of topics, adjunct clauses starting with *if*, *though*, *since*, *while*, *after* and so on, shorter adverbial phrases, and more. The prediction is that any of these adjuncts that have CommaP status will be systematically set off from a following root sentence by an IP break, as a consequence of Align R (CommaP, IP). If the left-peripheral adjunct does not have CommaP status, then the alignment constraint will be inapplicable, making it possible that only a MaP break would intervene between the adjunct and the root sentence that follows. It is possible of course that all left-adjoined adjuncts to root sentence have the status of Comma Phrase, but before further research is done on this matter we cannot know for sure.

Clear instances of Comma Phrases at the left periphery are supplements such as (28) or (29), which may also appear at the right periphery, or parenthetically. These are [+comma]-marked and have the intonational phrasing expected, with comma pause, availability of continuation rise, and a pitch register on the root sentence that is only slightly downstepped from the onset of the preceding IP.

(28) $IP(\text{True to herself})_{IP} IP(\text{ she planned to remain there.})_{IP}$

(29) $IP(\text{As you mentioned})_{IP} IP(\text{Alan claimed that cryptography is a blast.})_{IP}$

Consider next the sentences in (30)-(32). It is standard to write an orthographic comma to the right of an *if*- clause, or an *as for*-topic phrase, or a left-dislocated phrase, as seen here. And indeed a comma pause, the possibility of a continuation rise, and a significant upward partial pitch reset are properties of the phrase break before the root sentence in these cases. (The appearance of subject-aux inversion in the righthand clause here is evidence for its status as a root sentence.)

(30) $IP(\text{If you had a llama})_{IP}, IP(\text{could you ride it})_{IP}?$

(31) $IP(\text{As for llamas})_{IP}, IP(\text{do you think they're meaner than other ruminants})_{IP}?$

(32) $IP(\text{Those alpacas})_{IP}, IP(\text{did you look for them for a long time})_{IP}?$

For Emonds, an *if*-clause is a root sentence on its own. If, in the current theoretical context, it is indeed plausible to say that the *if*-clause is [+comma]-marked (and thus involves a separate speech act from the following clause), then the presence of the IP break here is predicted by AlignR (CommaP, IP). As for the *as for*-phrase in (31) or the left-dislocated phrase in (32), they also would require status as a [+comma]-marked expression, if their systematic IP status is to be explained. Potts (p.c.) suggests that topic

expressions like these might indeed be hidden speech acts, roughly glossed as “Now I’m talking about llamas (or alpacas),” or something along those lines.

A third type of topicalization construction behaves differently. This is the case of a topic that has been *moved* to a left-peripheral position, leaving a trace in its original sentence-internal position, as in (33) and (34):

(33) True to herself she planned to remain *t* (and to remain happy-go-lucky as well).

- (34) a. Alpacas I go for *t*.
 b. Alpacas you have to treat *t* with kid gloves.
 c. The alpacas she got *t* recently from some guy in New Hampshire.

Indisputably these preposed constituents are semantically (and syntactically) an integral part of the root sentence, and so cannot have the status of a Comma Phrase themselves. The prediction of the asymmetric interface alignment constraint for IP is that these topics will not have the status of IP. The truth of this prediction is obscured somewhat, however, by the focus status of these internal topics. Büring 1997, 2003 characterizes the topics produced through topicalization, as in (33)/(34), as *contrastive topics*, and gives them a semantics that is very close to that of contrastive focus. As we will see in the following section, contrastive focus has a systematic effect on the prosodic structure properties of a sentence; it is ultimately responsible for the fact that there are circumstances where an IP break may appear between the contrastive topic and the main body of the sentence. This means that the possible presence of an IP break after the non-[+comma]-marked contrastive topic is not problematic for the Align R (CommaP, IP) theory.

There are further instances of left-peripheral constituents which are plausibly neither [+comma]-marked or focus-marked and whose prosody is not particularly noteworthy, in fact no different from what you might find on a “neutral” non-topic subject, which is standardly set off as a MaP from what follows. They are not necessarily set off in a separate Intonational Phrase:

(35) On the fourth of July we’ll have a parade and fireworks

(36) The fourth of July will have a parade and fireworks.

(37) $IP((On) \text{ the } f_{H^*} \text{ou} \text{ } r_{H^*L^-} \text{th of July } ([w\partial l] \text{ have a } p_{H^*} \text{ara } n' \text{ fi } r_{H^*} \text{eworks } ^{L-L\%})_{MaP})_{IP}$

From the point of view of intonation, sentences (35) and (36) may be rendered identically, with a simple MaP break after the first constituent, and downstep of the phrasal register of the following MaP. Apart from the presence or absence of the initial preposition *on*, they may be segmentally identical as well, given that *will* and *we’ll* can reduce to the same phonetic sequence.

The lack of any IP break after the preposed adverbial in (35) would follow if the adverbial is moved to this position by root sentence-internal preposing and is moreover not a contrastive focus. It would also follow if the adverbial were adjoined to the root sentence, but were not Comma-marked, and hence not set off by an IP break. Whether just one of these analyses is available, or both, cannot be decided here, however.

The neutral rendering of the left-peripheral adverbial in (35) is not the only one available. Indeed we can pronounce the sequence in (35) with an Intonational Phrase break after the adverbial, which we could also write with a comma:

(38) (On the fou^{H*}rth of July^{H*L-H%})_{IP} , (we'll have a para^{H*}de and fi^{H*}reworks^{L-L%})_{IP} .

Could it be that the adverbial is functioning here as a [+comma]-marked supplement (Potts 2003), performing an additional speech act, one that is closely related of course to the one that's performed by the root sentence? In other words could it be the (optional) Comma Phrase status of the adverbial in this instance that accounts for the intonational phrasing here? If this were so, we should expect subtle meaning differences between the rendering of the sequence in (38) and the rendering found in (37). Alternatively, could it simply be that the intonational phrasing seen in (38) is a case of the *stylistic promotion* of MaP to IP, a phenomenon that will be explored in section 8? Only further research into these matters will allow us to tell for sure.

Summing up, the data on intonational phrasing presented in this and the preceding sections is consistent with the hypothesis that in the interface syntactic representation it is the Comma Phrase (Potts 2002, to 2005) and not the root sentence which is constrained to correspond to Intonational Phrase in phonological representation, and that this relation can be captured in terms of the asymmetric alignment constraint Align R (CommaP, IP). This theory of the syntactic grounding of Intonational Phrase requires some independent explanation for the cases where left-peripheral contrastive topics, which are not [+comma]-marked, are set off as distinct Intonational Phrases. We turn to that question in section 6. Before that we must put into perspective the proposal that Comma Phrase in the interface syntactic representation corresponds to Intonational Phrase in the phonological representation.

5. The syntactic grounding of the prosodic hierarchy as a whole

The proposal in the preceding sections concerning the grounding of the Intonational Phrase of phonological representation in the Comma Phrase of the interface syntactic representation allows for a filling out of the picture of the relation between syntactic constituent types and prosodic constituent types that has emerged in my work and the work of others over the years. In this work, syntax-phonology interface constraints call for the edge-Alignment of a designated syntactic constituent type to, or the Wrapping of a designated syntactic constituent type by, a corresponding designated constituent type in prosodic structure. The picture of the corresponding constituent types that we arrive at now is this:

(39)	<i>Prosodic constituent types</i>		<i>Corresponding Syntactic Constituent Types</i>
	Intonational Phrase	(IP)	Comma phrase (Potts 2005) (supplants the Root sentence of Emonds 1970, 1976)
	Major Phrase	(MaP)	Maximal projection of lexical category, i.e. XP (Selkirk 1986) [But see Kratzer and Selkirk 2004, where Major Phrase is argued to correspond to Phase and Edge of Phase.]
	Minor Phrase	(MiP)	Syntactically branching constituent, i.e. phrase (each branch has at least one word) (Kubozono 1993, Sugahara 2003, Selkirk et al 2003)
	Prosodic Word	(PWd)	Morphosyntactic word (lexical not functional) (McCarthy and Prince 1993a, Selkirk 1995)

Comma Phrase actually stands out in this picture as the only syntactic constituent type that is apparently “feature-marked”. All the other syntactic types here are characterized only in structural terms, and are explicitly cross-categorial (Selkirk 1986, 1995). Yet the [+comma] feature is not a feature on a par with other featural properties of syntactic categories such as [+verb] or [+plural], which are projected from the lexical/morphological components of constituents. Rather [+comma] identifies what is, semantically speaking, a “highest node”, in that the semantics of the Comma Phrase itself is independent of the at-issue entailments of any sentence to which it may be adjoined. Just like the other syntactic properties listed above-- word-hood, branching-node-hood and status as maximal projection (or, as phase and phase-edge), what’s provided by the designation [+comma]-phrase is a very general instruction to the semantic interpretation regarding the way in which the lexical meanings of the sentence should be composed. So, for the sake of conceptual clarity, reserving the term “feature” for properties that are related to the morphological content of sentences, let’s instead speak of the Comma Phrase as a “type” of syntactic node, on a par with “word” or “branching constituent,” for example.

What is remarkable, then, about the list above is (i) the fact that the entire list of syntactic category types that plausibly play a role in recent syntactic theory (specifically, the Comma Phrase plus the set playing a role in minimalist theory (Chomsky 1995, 1999) is included in it, and (ii) the fact that each of these has a correspondence to one of the exhaustive list of prosodic categories that arguably play a role in phonological theory: Intonational Phrase, Major Phrase (aka intermediate phrase), Minor Phrase (aka accentual phrase), Prosodic Word (Selkirk 1986, Beckman and Pierrehumbert 1986). This tight correspondence allows us to entertain the idea that the very repertoire of prosodic categories in phonological theory (at word level and above) is dependent on, or a function

of, the repertoire of syntactic category types defined in syntactic theory. (See Selkirk 1986 for a first statement of this idea.) The phonological terms that identify the different categories in the prosodic hierarchy would then simply be nicknames for “prosodic category related to a Comma Phrase” (Intonational Phrase), “prosodic category related to a maximal projection of lexical category [or edge and phase edge]” (Major Phrase), “prosodic category related to a (branching) phrase” (Minor Phrase) and “prosodic category related to a lexical word” (Prosodic Word). In other words, within the structure of the theory of grammar, the prosodic constituent types in phonological representation (at word level and above) would necessarily be grounded in the syntax.

This necessary correspondence between prosodic category types and syntactic category type can be captured in the theory of syntax-phonology interface constraints, which would define the relations between PF (surface syntactic representation) and PR (surface phonological representation) as having the general format in the schema in (40).

(40) $\mathfrak{R} (\Sigma_i, \pi_{\Sigma_i})$

Any constituent of type Σ_i in syntactic (PF) representation bears the relation \mathfrak{R} to some corresponding constituent of type π_{Σ_i} in phonological (PR) representation.

[The *any(all)-some* logical structure of this interface constraint schema is that proposed in McCarthy and Prince 1993b.]

The theory of grammar would posit only those prosodic constituent types which have a relation \mathfrak{R} to the extremely limited set of possible syntactic constituent types made available by syntactic theory. The constraint schemata in (41) below fleshes out this theory of the relation between syntactic and prosodic structure categories, given (40) and the claims about the correspondences in (39):

(41) Schemata for Syntax-Prosodic Structure Interface Constraints

- | | | |
|----|---|---|
| a. | $\mathfrak{R} (\text{CommaP}, \pi_{\text{CommaP}})$ | $(\pi_{\text{CommaP}} = \text{'Intonational Phrase'})$ |
| b. | $\mathfrak{R} (\text{Phase/Edge}, \pi_{\text{Maximal Projection}})$ | $(\pi_{\text{Maximal Projection}} = \text{'Major Phrase'})$ |
| c. | $\mathfrak{R} (\text{Branch}, \pi_{\text{Branch}})$ | $(\pi_{\text{Branch}} = \text{'Minor Phrase'})$ |
| d. | $\mathfrak{R} (\text{Word}, \pi_{\text{Word}})$ | $(\pi_{\text{Word}} = \text{'Prosodic Word'})$ |

(40) and (41) embody the claim that the *universal repertoire* of prosodic constituent *levels*, or *types*, to be found in phonological representations precisely matches the repertoire of prosodic constituent types that appear in the set of universal constraints on the interface between syntactic and phonological representations. Call this *the theory of the syntactic grounding of prosodic categories* at word level and above. (An earlier version of such a theory is put forward in Selkirk 1986.)

But despite the tight syntactic grounding proposed in this theory, there is an independence of prosodic and syntactic representations. While the grounding relation to the syntax defines the building blocks of prosodic structure representation (the prosodic category types in the prosodic hierarchy), in the phonology these building blocks do have a life of their own. Quite generally, general markedness constraints on prosodic structure representation will have the result that, in a particular phonological representation, there may exist instances of prosodic constituents which do not correspond to instances of syntactic constituents. We will see this in the next section on FOCUS-related phrasing. Moreover, phonological markedness constraints themselves will have to mention specific levels of prosodic structure, since the prosodic properties of words and the various levels of phrasing (e.g. prosodic minimality requirements or locus of metrical prominence) may differ in particular languages.

6. Contrastive FOCUS and intonational phrasing

6.1 A prominence-based theory of the FOCUS-intonational phrasing relation

In this section I will adopt an idea that has its origins in Jackendoff 1972, namely that contrastive focus is required-- by a syntax-phonology interface constraint-- to contain the metrical prominence of an Intonational Phrase (Selkirk 2003, 2004). So, the prediction goes, a sentence will contain at least as many Intonational Phrase *prominences* as it contains contrastive foci. And since, by the very nature of prosodic structure representation, the presence of a metrical prominence entails the presence of the constituent of which it is the head, there will be as many Intonational Phrase *constituents* as there are contrastive foci. Thus the contrastive focus status of a word or phrase in syntactic structure may have an effect on the intonational phrasing of the sentence in prosodic structure, even if the focused constituent is not a Comma Phrase.

Cases of multiple contrastive focus, with consequent multiple Intonational Phrases, arise under various circumstances. For example, in playing the board game *Clue*, players make suggestions or accusations answering the implicit question “Who did it where with what?” The game defines the set of possible perpetrators (Mr. Green, Miss Scarlet, Colonel Mustard, etc.), the set of possible locations, and the set of possible weapons. A rule book for *Clue* found on the internet gives (42) as an example of a well-formed suggestion (<http://www.winning-moves.com/rules/clue1949.htm>):

(42) “I suggest that the crime was committed in the LOUNGE, by MR. GREEN with the WRENCH.” [comma and capitalization in original example]

Speaking in terms of the theory of contrastive focus (Rooth 1992, 1995), the game already defines the membership of the alternative sets that are at issue with contrastive focus. In explicitly picking out the various capitalized items from the set of possible alternatives in (42), the player is producing a sentence with multiple contrastive foci. A subsequent player may follow up with a corrective:

- (43) No, I think the crime was committed in the GARDEN by MISS SCARLET with the KNIFE.

It seems to be the case that after each nonfinal contrastive focus here, one can naturally produce a continuation rise with the L-H% boundary tone combination, as well as a significant temporal disjuncture, if not actual pause—both indicators of the presence of IP breaks:

- (44) (I suggest that the crime was committed in the LOUNGE^{L-H%})_{IP} //
 (by MR. GREEN^{L-H%})_{IP} // (with the WRENCH^{L-L%})_{IP}

The representation of the contrastive focus feature in the interface syntax would be as in (45), where the feature, notated as FOCUS, has an effect both on the phonological interpretation of the sentence and on its semantics.

- (45) [I suggest that the crime was committed [in the lounge]_{FOCUS} [by Mr. Green]_{FOCUS}
 [with the wrench]_{FOCUS}]

(Kratzer and Selkirk 2004, in preparation, make a distinction between the contrastive focus feature FOCUS and the F-marking feature. In their system F-marking represents informational or presentational focus, and has distinct semantic and phonological properties.)

The claim here is that the set of syntax-phonology interface constraints in grammar includes the constraint in (46), which calls for a FOCUS-marked constituent to contain the *metrical prominence* of an Intonational Phrase. We can also refer to this prominence, equivalently, as the head, the main stress, or the designated terminal element (DTE) of Intonational Phrase; it will be notated as Δ IP.

- (46) **FOCUS-dominates- Δ IP (= FOC/ Δ IP)**

The terminal string of a contrastive FOCUS constituent in syntactic representation (PF) corresponds to string containing the metrical prominence of an Intonational Phase (Δ IP) in phonological representation (PR).

Thus, corresponding to the syntactic representation in (45), we have the prosodic structure representation in (47), in which Δ IP is shorthand for the prosodic representation of IP prominence.

- (47) Δ IP
 (I suggest that the crime was committed in the lounge)_{IP}
 Δ IP Δ IP
 (by Mr. Green)_{IP} (with the wrench)_{IP}

The representations of Δ IP prominence in this sentence are the consequence of the interface FOCUS representation. As for the presence of the Intonational Phrases

themselves, they are entailed by the Intonation Phrase prominences, given that the notion ‘head prominence of a constituent of level π ’ requires the presence of a ‘constituent of level π ’ which dominates that head prominence in the representation. This fundamental property of prosodic representation will be given a name—Head-of- π —and the characterization in (48). It could be considered to be an inviolable constraint on prosodic structure representations, a part of GEN.

(48) **Head-of- π**

Each head prominence of level π in phonological representation is dominated by a (distinct) instance of a prosodic constituent of level π in phonological representation.

Finally, following Truckenbrodt 1995 and Selkirk 2004, I will assume that in cases of multiple FOCUS, the location of the medial edges of Intonational Phrase that are found between each FOCUS is determined by prosodic alignment constraints. In English, the prosodic markedness constraint calling for the alignment of the head Δ IP with the right edge of IP will be given responsibility for the appearance of the break at the right edge of the FOCUS element.

Specialized syntactic structures of English provide us with other reliable instances of contrastive focus. For example, sentences with a gapping construction contain instances of multiple foci (Kuno 1976, Johnson 1996, Hartmann 2001), with the constituents on either side of the gap having the status of contrastive foci.

(49) Were they telling you about their trip?

Yes, Mary reported about the palazzo, and Kathy_{FOC} ___ about the sheep farm_{FOC}.

The sentence that serves as the antecedent to the gapped sentence-- *Mary reported about the palazzo* -- need not anticipate the contrastive focus structure found in the following sentence, and so can either have simple informational focus, or contrastive focus, or no focus at all. But the gapped sentence, which consists of an explicit parallel of the remnant, non-gapped, elements to the corresponding elements in the antecedent sentence, does show paired contrastive focus, and the consequent double intonational phrasing:

(50) Δ IP Δ IP
 (and [Kathy]_{FOCUS})_{IP} (about the [sheep farm]_{FOCUS})_{IP}.

(See Carlson (2001, 2002) on the prosody-dependent parsing of gapped sentences). The right-node-raising construction (RNR) in English also is plausibly considered one where the paired elements in the construction are in contrastive focus (Hartmann 2001, Selkirk 2002). Selkirk 2002 reports experimental results showing that a RNR sentence like that in (51) must have an IP break between the two contrasting FOCUS elements.

(51) Δ IP Δ IP
 (Megan entertained_{FOCUS})_{IP}, (and then debunked_{FOC} the copy theory)_{IP}

B: I don't know if that's such a good idea. *Alpacas you have to treat t with kid gloves.* Their hair gets really messy.

(56) A: I went out to Kathy's over the weekend. She really has a lot of animals. Has she been doing this a long time?

B. *The alpacas she got t from some guy in New Hampshire.* They were a gift from the colleagues last year. But I think she's had animals since 1984.

The discourse contexts in (54)-(56) are quite unlike those set up by multiple questions, as in (52), where each response contains a *pair* of contrastive FOCUS. The main body of the sentence in the (54-56) contains no contrastive FOCUS element, rather FOCUS only appears in the contrastive topic, as in (57):

(57) [[The alpacas]_{FOCUS} [she got from some guy in New Hampshire]]

The pronunciation of the topicalized sentences that seems most natural in these contexts is one with a final H*L- fall on *alpacas* and a final lengthening consistent with the MaP break expected at the right edge of the topic XP. There is also a notable downstepping down onto the sequence following the topic:

(58) ΔIP
 $IP((The\ alpha^{H*}cas^{L-})_{MaP} (!she\ got^{!H*}t\ from\ some\ guy^{!H*}\ in\ New\ Hamp^{!H*}shire^{L-L\%})_{MaP})_{IP}$

In other words, no IP break sets off the contrastive topic *alpacas* from what follows. In these cases, the entire sentence consists of one IP, with the contrastive topic bearing the FOCUS-induced prominent head of the IP.

The prosodic representation in (58) is the one that minimally satisfies the constraints that a FOCUS contain the head of IP, and that this ΔIP be accompanied by an IP constituent of which it is the head. The constraint Align R (CommaP, IP) is inapplicable here, given the non-Comma-marked status of the contrastive topic. In other words, no syntax-phonology interface constraint in the current system would call for a representation in which the FOCUS-marked contrastive topic in these single FOCUS sentences would be set off in a distinct Intonational Phrase from what follows. This is a good result. An alternative, alignment-based, theory of the FOCUS-intonational phrasing relation, discussed in the following section, does not share this result.

5.2 Against an edge-alignment theory of the FOCUS-intonational phrasing relation

The prominence-based theory of the FOCUS-phonology relation is an economical theory of the interface in that it stipulates a unique syntax-phonology interface constraint that involves FOCUS, one which relates FOCUS in the syntax to a single property in the phonological representation, namely ΔIP . This ΔIP property can be held responsible for the presence of the other prosodic properties that are characteristic of FOCUS, including the related intonational phrasing. I call this the Focus-Prominence theory of the focus-

phonology interface (cf. Selkirk 2004). In the current section I attempt to further build the case that the central property of contrastive FOCUS is indeed its metrical prominence, and that other properties are predictable consequences, produced in relation to that metrical prominence by general phonological constraint or phonetic interpretation. I should mention that, while the notion is fairly widespread among generativists that contrastive FOCUS in the syntax is related to metrical prominence or stress in the phonology (Chomsky 1971, Jackendoff 1972, Cinque 1993, Reinhart 1995, Truckenbrodt 1995, Ladd 1996, Rooth 1996, Zubizarreta 1998, Szendroi 2001), the specific claim I am making here that contrastive FOCUS is realized in the phonology as a stress prominence at the level of Intonational Phrase has been made by just Jackendoff and Reinhart, neither of whom couch this proposal within a theory of phonology that includes both metrical stress prominence and prosodic structure constituency as integral of phonological representation, or draw any phonological consequences from it.

This prominence-based theory of the FOCUS-intonational phrasing interface needs to be compared to an equally economical alternative theory of the FOCUS-prosodic structure relation that has been proposed in the literature. This alternative sees the relation between FOCUS and prosodic phrasing as direct, controlled by an interface alignment constraint which calls for the edge of a FOCUS-marked constituent in the syntactic representation to align with the edge of a phonological phrase (see Vogel and Kenesei 1987, Pierrehumbert and Beckman 1988, Hayes and Lahiri 1991, Jun 1993, Nespors and Guasti 2002 among others). If this alignment-based theory is to be equally economical, it would have to see the appearance of the metrical prominence associated with FOCUS as an automatic, phonology-driven, consequence of the presence of the interface-induced intonational phrasing. Both of these theories envision a FOCUS-phonology interface which is highly restricted; they would make direct appeal to only one aspect of the phonological representation of FOCUS, and seek to derive any other phonological or phonetic properties of FOCUS from the single phonological property specified in the FOCUS interface constraint.

The particular formulation of the phrasal alignment theory I will consider would align FOCUS with the edge of an Intonational Phrase:

(59) **Align R (FOCUS, IP)**

Align the right edge of a FOCUS-marked constituent in syntactic representation with the edge of an Intonational Phrase in phonological representation.

Specifying that the relevant prosodic category level is Intonational Phrase, as here, and not some lower level of phonological phrase, would allow this theory to account for the patterns of intonational phrasing that we saw above in English with multiple FOCUS. And specifying that it is alignment on the right would account for the generalization that it is the right rather than the left edge of FOCUS that is systematically marked by prosodic phrasing in English.

This alignment theory would see the fundamental property of FOCUS to be its phrasing, and would derive the presence of the distinctive Intonational Phrase prominence of FOCUS by constraint, in particular, by a constraint from a well-attested family of phonological markedness constraints that require that a prosodic constituent of level α be headed by a metrical prominence at level α .

(60) **IP Metrical Headedness**

The prosodic constituent IP must contain an IP-level metrical prominence Δ IP.

A first argument against the phrasal alignment theory comes from the case of contrastive topic prosody that we considered directly above. Within the representation in (58), the FOCUS-marked contrastive topic *alpacas* is *not* flanked on its right by an Intonational Phrase edge. Indeed, there is no special intonational phrasing associated with the presence of the early FOCUS in that sentence. The entire sentence is parsed as a single IP. Unless some principled explanation can be furnished for the lack of an IP break to the right of FOCUS in this case (and I can think of none at the moment), (58) will have to be taken as a counterexample to the claim that the right edge of FOCUS aligns with the right edge of IP. By contrast the prominence-based theory, taken on its own, predicts that there should be at most one intonational phrase in a sentence containing just one FOCUS and so would not predict the presence of medial IP edges in those cases.

There is a further weakness to the alignment-based account, namely its necessary reliance on the constraint IP Headedness. On the Focus-IP edge-alignment theory sketched here, IP Headedness is what would guarantee the presence of an IP-level prominence within a FOCUS constituent. IP Headedness would also predict that that *same* level of metrical prominence would appear within *any* IP, even if there were no FOCUS present. This appears to be a false prediction. Research on the prosody of FOCUS suggests that FOCUS constituents have a greater degree of metrical prominence than constituents that are not FOCUS-marked. Specifically, it is found in many languages that a contrastive FOCUS word and/or the stressed syllable of a FOCUS word displays greater duration than a word without contrastive FOCUS (Cooper, Eady and Mueller 1985, Eady and Cooper 1986, Eady et al 1986, Turk and White 1999 on English; Cambier-Langeveld and Turk 1999 on Dutch; Frota 2000, 2002 on European Portuguese; Heldner and Strangert 2001 on Swedish; Jun 1993 et seq on Korean; Pan 2004 on Taiwanese). It is also frequently observed that the pitch protrusion on the pitch accent of a contrastive FOCUS is greater than on a noncontrastive word in the same context (Brown et al 1980 on Scottish English; Pierrehumbert and Beckman 1988, K. Ito 2002 on Japanese; Jun 1993 et seq on Korean; Eady et al 1986, Bartels and Kingston 1994 on American English; Ladd and Terken 1995, Rump and Collier 1996 on Dutch; Kügler et al 2003 on German; Xu 1999 on Mandarin; Pan 2004 on Taiwanese; Elordieta 2004 on Basque; Gordon 2004 on Chickasaw). And intensity may distinguish contrastive FOCUS as well (Jun 1993 on Korean; Kraemer and Swerts 2001 on Dutch; Heldner on Swedish 2003). The notion that this combination of properties might have a source in the abstract representation of metrical stress or prominence is not particularly controversial in speaking of stress at the word-level. Yet virtually none of the cited authors have drawn the conclusion that these

FOCUS-related effects might be the consequence of a higher level of stress in the phonological representation of contrastive FOCUS; for the most part they present these observations without any theoretical interpretation. Here, however, I am proposing that these correlations between FOCUS on the one hand and f0, duration and intensity on the other are mediated by a phonological representation of stress prominence, one that is at a higher level than the phrasal stress to be found on nonFOCUS elements.

So, given the distinction between FOCUS and nonFOCUS, if the level of metrical prominence that FOCUS carries is indeed IP-level prominence, it must be the case that there is *no IP-level prominence cases of non-FOCUS*. This would mean that the constraint IP Headedness could not be playing a decisive role in many languages. (It would have to be either typically low-ranked, or non-existent.) As a consequence, the alignment theory of FOCUS phrasing could not rely on this independent phonological constraint, applicable in any IP, as a source for the distinctive metrical prominence in FOCUS constituents.

The difference between the two theories is best illustrated in a sentence where the nonFOCUS constituent being compared to the FOCUS one is one that is itself an F-marked informational focus (which would carry a pitch accent), as could be found in the common discourse context in (61).

- (61) Context: Why are you so upset?
- Informational: (a) ${}_{IP}(I\ met_F\ with\ Maria_F)_{IP}$ (b) ${}^*_{IP}(I\ met_F\ with\ Maria_F)_{IP}$ ΔIP
- Contrastive: ${}_{IP}(\text{Instead of Amanda}_{FOCUS})_{IP}$ ${}_{IP}(I\ met\ with\ Maria_{FOCUS})_{IP}$ ΔIP

The prominence-based theory stipulates the presence of ΔIP on the FOCUS elements, and is consistent with an absence of ΔIP in the absence of FOCUS, allowing for the (a) pronunciation of the informationally focused *Maria* above. But the alignment theory I have sketched, in order to guarantee the presence of ΔIP on FOCUS in the first place, requires the presence of ΔIP within every IP (through high-ranked IP Headedness). It would not allow for absence of ΔIP in (a), but rather commits to the apparently ungrammatical (b), and hence predicts no contrast in stress prominence in the FOCUS and nonFOCUS cases.

What should be clear from the cited phonetic data on the distinctively greater duration, pitch height and intensity of FOCUS is that the phonological structure of FOCUS is given a categorically distinct representation of metrical prominence from nonFOCUS elements that are contained in an Intonational Phrase. An interface theory which stipulates a FOCUS- ΔIP prominence relation, as that here, need stipulate only that distinctive level of prominence, which I have argued in the previous chapter section should be ΔIP . These phonetic effects, and phonological effects like intonational phrasing, fall out as an automatic consequence.

A final consideration weighs against an alignment theory of intonational phrasing, and in favor of the metrical prominence-based theory of the FOCUS-intonational phrasing interface. It concerns the general picture of the syntax-phonology interface. In section 5 I laid out a theory of the relation between syntactic category types and prosodic category types, one in which it is solely properties of constituent structure, and not a featural annotation of constituents, that plays a role in relating syntactic structure constituency to prosodic structure constituency-- through Align and Wrap constraints. The adoption of a FOCUS-intonational phrasing interface alignment constraint is not consistent with this interestingly restrictive theory of the relation between syntactic and prosodic constituency; it would also see prosodic phrasing as a consequence of the featural information-structure-marking of syntactic constituents. By contrast, I am suggesting that information structure properties of syntactic representation, like FOCUS, are instead reflected in the metrical prominence properties of prosodic structure. The syntax-phonology interface would thus have two modules, the constituency module and the prominence module. The former relates syntactic constituency to prosodic constituency, the latter relates information-structural-salience like FOCUS- and F-marking in the syntax to metrical prominence in prosodic structure (see also Selkirk 2004).

7. The alleged Sense Unit Condition on intonational phrasing

A final issue that needs to be addressed in connection with interface constraints on intonational phrasing is the status of the Sense Unit Condition, first put forward (in the generative tradition) in Selkirk 1984, and having its roots in Halliday 1967a,b. Steedman 1991, 2000 assumes the truth of the generalizations captured by the Sense Unit Condition and crafts a grammatical architecture and theory of syntax in which prosodically marked sense units coincide with syntactic units. More recently, the Sense Unit Condition has been advanced as an explanation for various sorts of prosodic phrasing-related phenomena that play a role in sentence processing (Straub et al 2001, Frazier et al 2004). In this section I want to lay out a number of reasons for thinking that the Sense Unit Condition is not in fact a principle of grammar.

The statement of the Sense Unit Condition in Selkirk 1984 reads as in (62) and the notion *sense unit* is defined as in (63):

(62) The Sense Unit Condition on Intonational Phrasing (SUC)

The immediate constituents of an intonational phrase must together form a sense unit.

(63) Def. Two constituents C_i , C_j , form a *sense unit* if (a) or (b) is true of the semantic interpretation of the sentence:

- a. C_i modifies C_j (a head)
- b. C_i is an argument of C_j (a head)

The SUC provided an explanation for, among other things, why the sentence in (64), due to Mark Liberman and cited in Pierrehumbert 1980, can be rendered with the intonational

phrasing in (64a) but not that in (64b). Liberman notes that (64b) would have a pronunciation virtually identical to that of (65):

- (64) Three mathematicians in ten derive a lemma.
- a. (Three mathematicians in ten)_{IP} (derive a lemma)_{IP}
 - b. *(Three mathematicians)_{IP} (in ten derive a lemma)_{IP}
- (65) (Three mathematicians)_{IP} (intend to rival Emma)_{IP}

In the (64b) case, there is no modifier-head or argument-head relation between *in ten* and *derive a lemma*.

It is important to point out first that the theory of grammar currently has other options for explaining the phrasing patterns above. In 1986, Selkirk and Nespor & Vogel proposed theories of prosodic phrasing based on an appeal to phrase-structural properties of the interface syntactic representation. The version of that interface theory presented in this paper, based on the asymmetric alignment of Intonational Phrase and Major Phrase, has an explanation for the facts in (64). Taglicht 1996 offers an alternative syntax-phonology interface theory of these and other facts as well.

Let us assume the “neutral” case where the interface syntactic representation of sentence (64) contains no contrastive FOCUS and where no elements of the sentence are given in the discourse. The syntax-phonology interface constraint Align R (XP, MaP) would require that the subject DP in (64) be parsed into a separate Major Phrase from the VP that follows:

- (66) ((Three^{H*} mathemati^{!H*} cians in ten^{!H*-L})_{MaP} (deri^{H*} ve a le^{!H*} mma^{L-L%})_{MaP})_{IP}

That a parsing of this sentence into two Major Phrases is possible is supported by the details of pronunciation. There may be a simple fall at that end of the first Major Phrase, due to the presence of the L- boundary tone for MaP, but since the final fall of a MaP is difficult to distinguish from the final fall of an IP, represented as H*L-L%, it is the other prosodic features which point to the MaP analysis. It is natural to render this sentence without the pause or final lengthening associated with Intonational Phrase. And it is also possible to realize a phrase-initial pitch register for the second MaP which does not bring it to the high level that is found with the onset of an IP. The pronunciation in (66) is in some sense the basic pronunciation of this sentence type.

There is a further possible pronunciation of this FOCUS-less sentence which analyzes the component Major Phrases in this sentence type as Intonational Phrases as well. In this pronunciation, a fall-rise contour is available at the end of the subject, a substantial “comma pause” may appear, and the pitch register of the predicate phrase would be elevated with respect to the ending point of the preceding subject:

- (67)

((Three^{H*} mathemati^{!H*} cians in ten^{!H*L-L%})_{MaP})_{IP} // (([^]deri^{H*} ve a le^{!H*} mma^{L-L%})_{MaP})_{IP}

All these properties are consistent with the parsing of the sentence into two Intonational Phrases. How would the grammar derive this alternative to the basic MaP parse? In the following section I will suggest that certain instances of intonational phrasing are produced through what I will call *stylistic promotion*, whereby, for stylistic motives, a basic MaP parsing is rendered as an IP parsing. I think this is what is at issue here.

The important point in this connection is that this theory of the permissibility of the intonational phrasing in (64a) (=67) also provides an account for the impermissibility of the intonational phrasing in (64b). It is based on the understanding of the syntax-Major Phrase interface provided by the alignment constraint Align R (XP, MaP): given that *Three mathematicians* is not itself a maximal projection, it would not be parsed as a MaP separate from the rest of the DP. So there is no basis for a stylistic promotion into a structure like (64b). On this account, then, the theory of major phrasing forms part of the theory of intonational phrasing, and it is the theory of major phrasing which renders superfluous the Sense Unit Condition as an explanation for the phrasing possibilities of (64) and a host of other cases. Interesting confirmation of this claim comes from the production experiments of Schafer, Speer, Warren and White 2000, who report that in an elicited spontaneous speech task, English speakers always produce at least a Major Phrase break at the right edge of a syntactic phrase but do not produce a phrase break phrase-internally between a lexical head and its complement. This finding is support for the claim that Align R(XP, MaP) is at play in English phrasing. And since Schafer et al sometimes find an IP break instead of a MaP break at this position, one could surmise that this option in realization is the result of stylistic variation.

Moving on to more general considerations, theories of grammar such as the one proposed here, which account for prosodic phrasing properties in phonological representation in terms of the information-structure-annotated phrase structure of the interface syntactic representation, are a priori more appealing than a theory making use of the Sense Unit Condition. This is because the Sense Unit Condition implies a questionable architecture of the grammar, and is based on grammatical notions that are not independently required. The notions head and argument appealed to in the formulation of the SUC are not features of the interface syntactic representation. If anything, they are notions that are semantic in kind. So the SUC has no place in a Chomskyan model of grammar (whether the *Aspects*-based or minimalist) that allows phonology to interface only with surface syntactic representation, or PF, not with the semantics. And even if one were to depart from this architecture, one would not find heads and arguments and modifiers in semantics, for the theory of semantics does not define these notions independently. Take the example of a head verb and an object argument. According to the Heim and Kratzer 1997 theory of the semantic interpretation of a sentence, the lexical meaning of a verb will simply specify whether or not the verb must combine with some other element (referred to informally as its argument) in the course of the composition of the sentence meaning. That element will be specified to be of a designated semantic type. The general notion 'argument', though, plays no role in computing the meaning of the sentence. There is no direct representational or structural notion of head and argument in the

semantics any more than there is in syntax. Hence the SUC, as defined by Selkirk 1984, is a grammatical condition lacking the grammatical underpinnings that would allow it to have an effect in the first place. My claim now is that any and all desirable effects that have been ascribed to the SUC are instead understandable as the consequence of constraints on the interface between syntactic and phonological representations, such as have been exploited above.

The claim is also that none of the *undesirable* effects of the SUC would be captured by the current system of interface constraints, a point we now turn to. In this paper we have already seen examples of Intonational Phrase which do not form a sense unit, and so are problematic for the SUC. It was shown in section 3 that a supplement expression (= Comma Phrase) is followed by a IP break, but may fail to be preceded by one, since there are cases where just a MaP break precedes. This asymmetry creates Intonational Phrases that are constituted of supplementary expressions and the material that precedes them in the sentence. For example, the “head” of a nonrestrictive supplementary relative clause forms part of the same IP with what follows, though no possible head-argument or modifier relation exists between them. The SUC predicts such phrasing should not exist. The interface alignment theory proposed here, by contrast, does successfully derive them: the phrasing patterns that we see with supplemental, Comma Phrase expressions are derivable through the asymmetric syntax-prosodic structure interface constraints Align R (CommaP, IP) and Align R (XP, MaP).

So there are three arguments presented here against the Sense Unit Condition as a grammatical condition governing intonational phrasing. First, it is superfluous, since independently motivated interface constraints already capture the desirable effects. Second, it makes the wrong predictions, wrongly excluding intonational phrases that are not sense units. (I am concurring with Taglicht 1996, then, who makes these first two points.) And lastly, in the Selkirk 1984 formulation at least, the SUC is not strictly speaking formalizable, since it requires appeal to informal descriptive notions that have no place in syntactic or semantic representation.

In recent work, Watson and Gibson 2004 have proposed as an alternative to the SUC a processing constraint which they dub the Anti-Attachment Hypothesis, which essentially says that an Intonational Phrase boundary after a lexical head will disfavor the attachment of the following word or phrase into the same syntactic phrase as that lexical head. While Watson and Gibson seem to have shown that the SUC makes the wrong predictions in a certain class of cases, they have not shown the need for an independent processing principle like the Anti-Attachment Hypothesis. This is because their results appear to be explainable by the grammatical theory of intonational phrasing that I have outlined above.

8. Variability in Intonational Phrasing

When I refer to variability in intonational phrasing, I am speaking of the fact that sentences with the same gross syntactic structure may show different patterns of intonational phrasing. A first major source of variability, observed above in section 6,

lies in the interface representation itself, specifically, in variation in the FOCUS-marking of the syntactic structure (and its attendant semantic/pragmatic interpretation). We saw above, for example, that the number of Intonational Phrases in a sentence would vary according to the number of contrastive FOCUS-marked constituents in a sentence. Another source of variability in prosodic phrasing lies in the length of constituents, counted in terms of words. And another source seems to simply be the style, or genre, of presentation, alluded to in the section above.

To reiterate the point about variability due to FOCUS, a sentence with the same phrase structure and lexical content may appear with different FOCUS structures, often prompted by different discourse contexts. So in the sentence context (56), repeated here as (68), the bracketed target sentence has just one FOCUS and is parsed with just one IP, while in the context in (69), the target sentence would naturally have two FOCUS and hence two IP:

(68)

A: I went out to Kathy's over the weekend. She really has a lot of animals. Has she been doing this a long time?

ΔIP

B. IP([The alpacas]_{FOCUS} she got t from some guy in New Hampshire)_{IP}. They were a gift from the colleagues last year. But I think she's had animals since 1984.

(69)

A: I went out to Kathy's over the weekend. She really has a lot of animals. Where did she get all those animals?

ΔIP

ΔIP

B. IP([The alpacas]_{FOCUS})_{IP} IP(she got t from [some guy in New Hampshire]_{FOCUS})_{IP}.

ΔIP

ΔIP

IP([The goats]_{FOCUS})_{IP} IP(she bought t from [her friend in Colrain]_{FOCUS})_{IP}

The length of constituents is also known to have an influence on the prosodic structure phrasing of a sentence (Selkirk and Tateishi 1988, Selkirk 2000, Sandalo and Truckenbrodt 2002, Elordieta et al 2003, Selkirk et al 2004, Hellmuth 2004, Prieto to appear). Compare, for example, the Major Phrase organization of the sentences in (70) and (71).

(70) The most famous signers of the Declaration of Independence are

(Tho^{H*}mas Je^{H*}fferson^{L-})_{MaP}, (Ben^{H*}jamin Fran^{H*}klin^{L-})_{MaP}, and (Geor^{H*}ge Wa^{H*}shington^{L-L%})_{MaP})_{IP}

(70) is what we expect, given the XP status of each of the items in the list and the alignment constraint Align R (XP, MaP): each item is parsed into a distinct MaP. The final fall to L- and the slight temporal disjuncture are indicators of this MaP status. But (69) is not the only possible prosodic organization for sentences with structures of this general type. There are other renderings which depart from this sequence of MaP parses for the entire list. In (71), where the XPs in the list consist of just one word, the

pronunciation of the list may (optionally) be as just one MaP, consisting of a sequence of Minor Phrases headed by the accented word. Here no L- is found at the end of each of the XP in the list, and there is less disjuncture between the phrases than in (70).

(71) The most famous signers of the Declaration of Independence are
 (Je^{H*}fferson, Fran^{H*}klin, and Wa^{H*}shington^{L-L%})_{MaP})_{IP}

This effect of prosodic word count on Major Phrase organization is seemingly a minimality effect: a Major Phrase prefers to be at least binary, containing at a minimum two words, or two minor phrases (Selkirk 2000). In this case, the minimality constraint optionally outranks the interface alignment constraint calling for MaP edge at the edge of XP.

Perhaps it also a prosodic length effect, of a different sort, that makes it very natural for the component XPs of the list in (72), by contrast, to have the status of Intonational Phrase:

(72) The most famous signers of the Declaration of Independence are
 IP(the designer of a beautiful plantation and house in Charlottesville, Virginia)_{IP},
 IP(an inventor and scientist who was ambassador to France)_{IP}, and
 IP(a man made famous to schoolchildren by his refusal to tell a lie)_{IP}.

Watson and Gibson (in press ab) report results of production tests showing that an intonational phrase break is more likely to appear at a fixed syntactic phrase break the longer the preceding and following constituents are.

Finally, there are instances of variation in intonational phrasing which do not plausibly have to do with either FOCUS or length. When this is the case, the version of the sentence with more than the minimally required intonational phrases may seem ponderous, admirably clear, or generally emphatic, depending on the circumstances. Compare the neutral rendering (73a) of sentence (73) with the Intonational Phrase-laden version in (73b):

(73) Bertrand Russell thought the King of France was very bald.

a. IP_{MaP}(Ber^{H*}trand Ru^{H*}ssell^{L-})_{MaP} (thought the Ki^{H*}ng of Fra^{H*}nce^{L-})_{MaP}
 (was very ba^{H*}ld^{L-L%})_{MaP})_{IP}

b. IP(Ber^{H*}trand Ru^{H*}ssell^{L-H%})_{IP} // IP(thought the Ki^{H*}ng of Fra^{H*}nce^{L-H%})_{IP} //
 IP(was very ba^{H*}ld^{L-L%})_{IP}

For want of a better term, I will refer to the gratuitous promotion of MaP to IP that we see in (73b) as *stylistic promotion*.

The distinction between FOCUS-induced, length-induced and style-induced variation in intonational phrasing will need to be kept in mind as future research attempts to assess

the extent to which intonational phrasing is driven by factors having to do with the nature of the interface representation, and by factors having to do with style or genre.

8. Conclusion

A fairly standard theory of the architecture of a grammar forms the framework in which the proposals advanced in this paper have been made. In this theory the phonological representation of a sentence interfaces with the syntactic PF representation, and makes no direct connection to semantic representation. But the syntax does include properties which influence both the semantics and the phonology—(i) the essential immediate constituent structure with a distinction between *syntactic constituent types*, including the Comma Phrase that is outside of the at-issue entailments of the proposition expressed by the sentence (Potts 2003, 2005), and (ii) an *annotation for information structure*, be it the FOCUS-marking of contrastive focus or the F-marking of informational focus (Kratzer and Selkirk 2004). In this paper I have proposed that a direct connection is made between CommaP in the syntax and Intonational Phrase in the phonology, through the interface constraint Align R (CommaP, IP). I have also proposed an indirect effect of contrastive FOCUS-marking on intonational phrasing, due to the Intonational Phrase prominence Δ IP that I claim is required, by interface constraint, to be contained within a FOCUS-marked constituent. These interface constraints, in ranked interaction with a variety of purely phonological prosodic structure markedness constraints, define what are possible Intonational Phrase parses for a particular sentence. Outside the realm of these grammatically controlled phrasings I have suggested there are effects which I have referred to as stylistic, and which I suggest involve optional promotion of Major Phrases to Intonational Phrases. In list form, I am claiming that the sources of Intonational Phrase in prosodic structure are these:

- i. The syntax-phonology interface constraint Align R/L (CommaP, IP)
- ii. The syntax-phonology interface constraint Align R/L (XP, MaP), with *stylistic promotion* of Major Phrase to Intonational Phrase
- iii. The syntax-phonology interface constraint FOCUS-dominates- Δ IP [in conjunction with the prosodic hardware requirement Head-of- π specifies that for each metrical prominence of type $\Delta\pi$ there is a prosodic constituent of type π containing it]
- iv. Prosodic structure markedness constraints on minimum and maximum size of Intonational Phrase (and Major Phrase)

Arranged in an appropriate language-particular constraint ranking, and with a language-particular choice for right- or left-alignment, these constraints should be able to characterize the intonational phrasing patterns for any language.

It is my hope that this quite restrictive theory of intonational phrasing will form the foundation for a more complete understanding of the intonational phrasing produced and

understood by speakers of any language, an understanding that will be gained through the examination of corpus materials, production and comprehension experiments and cross-linguistic comparison.

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