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Intonation in the grammar of Turkish

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Abstract

We claim that the observed word order variations, information structure and the phrasal intonational structure correlate with each other in Turkish, rather than determine one way or the other. Therefore the relation must be mediated. Turkish prosody imposes precedence constraints on certain intonational contours that are responsible for the realization of information structural units, and the lexical syntactic types are reflections of these constraints on grammar, which must include directionality, syntactic types of boundary tones as lexical items, and presyntactic type projection of pitch accents to words in a string. What we then get is one lexicalized grammar mediating the correlation for all kinds of constituencies and compositional meanings, reflecting the phonological, syntactic, semantic and prosodic nature of the constraints on possible lexical categories. We describe an inventory of Turkish tunes and intonation patterns, along with their syntactic types and compositional semantics, and provide an account of systematicity in intonation and information structure using Steedman’s theory of syntax-phonology interface. The argument is backed by intonational analysis of recorded speech data.

Keywords: Word order; Intonation; Information structure; Turkish; Combinatory Categorial Grammar

1. Introduction

The conventional view in Turkish linguistics is that Turkish is a verb-final language with free word order. The orders other than SOV (five other orders of the subject, object and the verb) are considered marked, with certain surface positions identifying grammatically determined discourse functions (focus for the immediately preverbal position, background for the postverbal positions, topic for the sentence-initial position, etc.).

Although this way of thinking might be intuitively appealing, we show that it is not descriptively adequate, therefore it does not provide the right ground for explaining the interaction of information structure and syntax in Turkish. Moreover, it implicitly commits itself to a linguistic theory in which there are conditions on derivations (surface configurations), multiple syntaxes (for word order, information structure, etc.), or in which surface structure must be a level of representation so that surface positions can be predicated over it. We show that adjacency as the sole basis of grammar eliminates the proliferation of syntaxes and avoids predications over surface positions.

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The current paradigms in linguistics regarding the interaction of information structure and syntax are two mainstreams: The Prague School and its offshoots conceive the relation via multiple linguistic levels with structural and functional aspects (Dik, 1997; Hajičová and Šgall, 1988; Šgall, 1967; Šgall et al., 1986). What we can call the derivationalist approach reads information structure off of syntactic structure in derivational configurations, such as the periphery, and the preverbal and postverbal domains (Epstein et al., 1998; İşsever, 2003; Kennelly, 1999; Kornfilt, 2005a; Lebeaux, 1991; Rizzi, 1997). A third approach, that of Steedman (2000a, 2002), which is the radically lexicalist approach, attempts to free derivations from conditions and multiple levels, by lexicalizing a grammar via combinatorial syntactic types (aka. categories), with lock-step assembly of their semantics reflected in constituent structure, information structure and intonational structure. Radical lexicalism is so called by Karttunen (1989) because all language-particular information is in the fully lexicalized grammar and the lexicon.

Turkish data is critical in this debate due to free word order and its consequent syntactically unorthodox intonational constituents, such as those in (1).¹

   I door-ACC A break-PAST think-IMPF-PAST-1s
   ‘I thought Ali broke the door.’

   b. Hayır, (PENCERE-YI Ali), (kapı-ı) (MEHMET kırdı.)
   No window-ACC A door-ACC M break-PAST
   ‘No, Ali broke the window, and Mehmet, the door.’

Example (1b) is a potential response to (1a), and at first sight it seems to disalign information structure, functional structure, constituent structure and intonational structure, suggesting either derivational (surface-configurational) constraints or Prague-style strata (e.g. Kılıçaslan, 2004 proposes a syntax for information structure). The OS order in (1b) is considered nonbasic in the literature, and the intonational phrases in parentheses are syntactically nontraditional constituents. (1b) also carries distributed new information which is grammatically unaligned (window is the object, and Mehmet is the subject).

We argue in this paper that the radically lexicalist alternative is the simpler and narrower hypothesis to account for the phenomena. Information structure, constituent structure and intonational structure can all be read from the lexicalized syntactic types, once we have an adequate inventory of tunes to support an autosegmental-metrical theory of phonology (following Bruce, 1977; Ladd, 1996; Liberman, 1975; Pierrehumbert, 1980; Pierrehumbert and Hirschberg, 1990; Selkirk, 1984, 1995), and an adequate theory of lexical syntactic types such as Combinatory Categorial Grammar (hereafter CCG), to set up a completely transparent syntax-phonology interface proposed by Steedman (2000a).

Our motivation for radically lexicalizing Turkish information structure is empirical, in as much as it strives for theoretical simplicity and predictive power. The kinds of dependencies we see among the informational units such as the theme, rheme, topic, focus and background do not extend to the kinds of dependencies in syntax, which can be the recursively nested dependencies or the lexically controlled crossing variety as Shieber (1985) proved. The work by Prague School and British Functionalist School (e.g. Halliday, 1967) confirmed that information-structural dependencies manifest limited structures. We suggest that the limited nature of these structures arise from their intrinsic dependence on phonological aspects, which we propose to capture in the syntactic types of boundary tones and pitch accents.

The goal of the current paper is to develop an inventory of Turkish declarative tunes and their syntactic types towards this end. We do not consider interrogatives or imperatives. In CCG, anything that bears a syntactic type is part of the grammar (i.e. it has compositional semantics), and we justify the inclusion of pitch accents and boundary tones in a grammar by deriving their compositional semantics. We show how declarative tunes relate information structure

¹ Throughout the paper we use the following conventions: A word in capitals denotes focal accent. Parentheses in the data indicate intonational phrases, such as (PENCERE-YI Ali) in (1b). To avoid misunderstanding, we do not show focal accents in English glosses, nor cleft.
and intonational structure – and by direct implication in CCG, constituent structure – so that surface word order can be associated with the traditional roles ascribed to it in the literature.

The paper is organized as follows. Section 2 describes how tunes and syntactic types can be associated in a lexicalized grammar. This has already been shown by Steedman (2000a). We briefly elaborate on the potential effects of free word order on the same task. The reader can skip section 2 in a first reading if she is convinced that such an enterprise is possible without derivational constraints, movement or privileged surface positions. We return to it in section 7 to culminate the syntactic types with intonational constraints we propose. Section 3 reappraises the position-based proposals. Section 4 establishes the vocabulary on which we build our proposal: The pitch accent and pitch contour inventory of Turkish. Section 5 discusses the relation between word order and intonation in light of section 4. Section 6 presents our proposal to relate Turkish tunes with information structure. Section 7 shows the reflections of our constraints on a radically lexicalized grammar.

2. Tunes and syntactic types

We take as our starting point Ladd’s (1996) basic division of intonation into tunes and prominence, and Steedman’s (2000a) proposal to have the syntactic types mediate these two dimensions, which in effect delivers information structure through feature percolation by the lexicalized syntactic types. Lexicalizing the syntactic types bearing information structural features is essentially a nonuniversalist view of the link between phonetic and information structural prominence (see Ladd, 2008 for the reasons why the universalist accounts fail). We adopt from Steedman (2000a:exx. 67–68) the following example to describe the syntactic type-driven derivation of information structure, phrasal intonational structure and constituent structure in CCG.2

The derivation makes use of two universal rules of CCG, namely application (3a and b) and composition (3c and d), all of which arise as a consequence of Schönfinkel’s (1920/1924) notion of adjacency reflected on syntactic types, as proposed by Steedman (2000b), which yields adjacency as the sole basis of grammar.3

2 [S] and [H] are respectively the speaker and hearer modalities employed by Steedman, to relate the information structural roles to the use of utterances in context. They can be eliminated at any point in the derivation, by a process called LF normalization, as in the bottom line of (2). Focus of constituents is reflected in the LF, using an asterisk (*), e.g. /C3 prove\_0 and /C3 completeness\_0 in the same example.

3 CCG’s universal principles also license the crossing variety of compositions below, unlike Lambek Categorial Grammars. We exemplify the use of these rules later.

Forward Crossing Composition: \( X/Y : f \rightarrow Y/Z : g \rightarrow X/Z : \lambda x.f(gx) \) \( (> B_x) \)

Backward Crossing Composition: \( Y/Z : g \rightarrow X/Y : f \rightarrow X/Z : \lambda x.f(gx) \) \( (< B_x) \)
All of the items in the top row of (2) are lexical items, and the derivation is entirely syntactic type-driven (written in italics, with features as subscripts). This is highlighted in the redrawing of the same derivation in (4). The LF, theme (θ) and rheme (ρ) decorations are stripped off in (4) for easier exposition (η' of L- in 2 is a local placeholder for the LF-correlate of θ or ρ, i.e. θ' or ρ'). The dollar notation in $X$ is a conventional way to abbreviate lexical generalizations in CCG. It denotes all functions in the lexicon that are onto $X$, and it can be directionally specific, e.g. $S/NP$ contains \{S'/NP, S'/NP\'} in Turkish, but not \{S/NP, S/NP\'}.

The boundary tones (H% and L%) and the intermediate phrase boundaries (H- and L-) are autonomous strings. They are bonafide lexical items with perceptual correlates, pairing a phonological form and a logical form via their syntactic types. The example delivers the intonational phrasal constituents (Marcel proved) and (completeness) without movement or traces, as their full interpretability in the fourth and the sixth lines of the derivation shows. They are also syntactic constituents, because universal syntactic rules for binary combination and lexical rules for unary type raising deliver them.

All information projects from the lexicon, in which the items with syntactic types constitute the lexicalized grammar. We show the ingredients of the lexical item (5a) in (5b). Pitch accents on words are reflected in their syntactic types and LFs, such as those for proved and completeness in (2). This process can be assumed to take place presyntactically as suggested by Steedman (2000b), by a rule of associating autosegmental-metrical features with the acoustic correlates of the items in the surface string (or with visual correlates in sign languages).

(3) a. Forward Application:
   \[ X/Y : f \quad Y : a \rightarrow X : fa \quad (> \) \]
   b. Backward Application:
   \[ Y : a \quad X\backslash Y : f \rightarrow X : fa \quad (< \) \]
   c. Forward Composition:
   \[ X/Y : f \quad Y/Z : g \rightarrow X/Z : \lambda x.f(gx) \quad (>B \) \]
   d. Backward Composition:
   \[ Y\backslash Z : g \quad X\backslash Y : f \rightarrow X\backslash Z : \lambda x.f(gx) \quad (<B \) \]
   e. Forward Type Raising:
   \[ A : a \rightarrow T/(T\backslash A) : \lambda f.f.a \quad (>T \) \]
   f. Backward Type Raising:
   \[ A : a \rightarrow T/(T\backslash A) : \lambda f.f.a \quad (<T \) \]
CCG pairs phonological forms and logical forms via syntactic types, without other intermediaries or on-line history of derivations such as trees, chains or phases, therefore it leaves no ground to predicate over a syntactic type such constraints as the left periphery, the preverbal/postverbal domains, or the immediately preverbal position of a string.

Consider $NP\ (SS\ \backslash NP)_{\text{lex}} \rightarrow SS$ as a potential position-dependent rule for Turkish immediately preverbal focusing. It violates CCG’s Principle of Combinatory Type Transparency (Steedman, 2000b:37). The rule is subsumed syntactically by the universal rule of function application, $XY\backslash Y \rightarrow X$, yet their semantics are not necessarily compatible: Function application engenders all syntactic derivations as long as the syntactic types match, including the substring $\text{kapı-}y\text{i kır-dı}$ in MEHMET kapı-\text{y}i kır-dı (M door-ACC break-PAST) ‘Mehmet broke the door’. Kapıyı is defocused in the context of the question Why did Ali break the door? Consider also another alternative to capture the immediately preverbal position, by referral to the surface position of a major lexical category such as $V$ for the verb. The rule could be $NP\ V \rightarrow NP\ focus\ V$. First, such a rule is impossible in CCG because it does not combine anything. Second, even if it were allowed, it would not be type-dependent because $V$ is not a type. Thus, reference to surface positions either violates type transparency or type-dependence of rules.

The information structural roles of syntactic objects are explicit in their syntactic types and LFs, as shown in (2), and constituent structure is available at any point in the derivation. Certain tunes, e.g. L-H*, are only theme-marking ($\theta$), and H* is only rheme-marking ($\rho$), in English. Thus a prerequisite to an information-structurally complete lexicalized grammar is the determination of inventory of tunes in a language, and their information structural roles.

The free word order observed in Turkish and in many other languages manifests itself in the syntactic types and logical forms. For example, one can characterize Turkish as basically a verb-final language if syntactic facts warrant this conclusion. In this case, the lexical category of for example the transitives can be thought to comprise both (6a) and (6b), which can be compiled into a single entry in (6c), where the curly braces indicate a set of arguments (following Baldridge, 2002). The corresponding set-lambda arguments are paired left-to-right by convention.

(6)  
1. $\text{oku}_1$ (read) := $(S\backslash NP_{\text{acc}})\backslash NP_{\text{nom}}\colon \lambda x\ y. read'yx$  
2. $\text{oku}_2$ (read) := $(S\backslash NP_{\text{nom}})\backslash NP_{\text{acc}}\colon \lambda x\ y. read'xy$  
3. $\text{oku}$ (read) := $S\backslash NP_{\text{nom}}\\backslash NP_{\text{acc}}\colon \lambda (x, y). read'yx$  

   OSV
   SOV
   Verb-final

Lexicalizing the Turkish word order in the category of verbs en masse as in (6a–c) has its surface-syntactic and information structural consequences. For example, postverbal word orders would not be lexically specified by the verb, for no combinatory rule in CCG can combine the lexical categories of verbs in (6) with that of postverbal arguments, as shown in (7). A purported rule such as $X\backslash Y \rightarrow X$ would not only wreak havoc in a surface grammar by allowing functors to combine with their arguments in any order, it would also give wrong semantics for the licit derivations. It is eliminated by the Principle of Directional Consistency (Steedman, 2000b:54).

(7)  

\begin{align*}
\text{Adam} & \quad \text{oku-du} & \quad \text{kitab-ı} \\
\text{man.NOM} & \quad \text{read-PAST} & \quad \text{book-ACC} \\
\frac{NP_{\text{nom}}}{NP_{\text{nom}}} & \quad S\frac{NP_{\text{nom}}}{NP_{\text{acc}}} & \quad NP_{\text{acc}} \\
\end{align*}

‘The man read the book.’

Therefore, under the OSV-and-SOV (verb-final) basic word order assumption, clauses with postverbal arguments require lexical rules such as contraposition (Bozsahin, 2002), defined in (8), which preserve LF dominance relations. Notice that the rules make no reference to surface positions at all. Postverbalness is captured in the lexical syntactic

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4 We use right displacement as a descriptive term to avoid potential confusion with right dislocation. More precisely, right displacement in Turkish does not leave a pronoun behind as it does in French right dislocation. Similarly, we use left displacement rather than left dislocation when there is no resumptive pronoun.

The rules in (8) we believe do justice to the term displacement. If a lexically specified right NP argument (i.e. a ‘$NP^r$’) can appear to the left of the predicate which is identified by its syntactic type $S/\text{NP}$, the argument would look for the predicate in the forward direction, i.e. as $S/(S/\text{NP})$. Moving a right NP argument further right would not be displacement. Similar considerations apply to left arguments. These rules are the corrected versions of Bozsahin’s (2002) contraposition rules, which we augment with intonational features in section 7.
type $S\backslash(S\backslash NP)$ because these are lexical rules. (CCG’s lexical rules are unary rules in the lexicon which may in principle apply to any substantive type to produce another substantive type. They are not rules that necessarily apply to lexical items to produce lexical items.)

(8) a. $NP \rightarrow S/(S/\text{NP}_{\text{topic}})$  
   b. $NP \rightarrow S/(S/\text{NP}_{\text{non-topic}})$  

Leftward displacement of right NP arguments ($<T_x$). Rightward displacement of left NP arguments ($>T_x$). The differences in the scrambling behavior of Japanese and Turkish are explained in Bozsahin (2000) by the differential lexical accessibility of the result types of these rules, modeled by the slash modalities of Baldridge (2002).

Derivations such as (9) are forced to use lexical assumptions beyond the lexical category of verbs (witness the use of the lexical rule $\backslash T/C2$). By implication they engender nonbasic surface word orders because basic word order is captured in the category of verbs. We note the syntactic carrying of information structural roles, such as the $\text{[ } \exists \text{ topic} \text{]}$ feature we use in lieu of more in-depth analysis.

(9) Adam
  man-NOM oku-du 
  read-PAST kitab-ı 
  book-ACC

\[
\begin{array}{c}
\text{NP}_{\text{nom}} \\
(S/\text{NP}_{\text{nom}, \text{NP}_{\text{acc}}}) \\
(S/\text{NP}_{\text{acc}})_{T_x} \\
(S/\text{NP}_{\text{acc}, \text{topic}})_{T_x} \\
S/\text{NP}_{\text{nom}}
\end{array}
\]

‘The man read the book.’

Thus, free word order in a language can be reflected in a lexicalized grammar, just as relatively rigid word orders can. In both cases, the universal syntax of CCG works the same way, leaving no room to predicate derivational constraints such as the immediately preverbal position. Typologizing for example the Turkish transitives as $S/\text{NP}_{\text{nom}}/\text{NP}_{\text{acc}}$ (for SOV) does not make the $\text{NP}_{\text{acc}}$ the immediately preverbal argument in the surface structure. Leftward-looking residues can have the types $S/\text{NP}_{\text{acc}}$ or $S/\text{NP}_{\text{acc}}$ unboundedly, via function composition. This is the case for Turkish (the syntactic type $T$ of the material within brackets [ . . . ] is shown as $[ T ]$):


‘You know that I think the man saw the child.’

Similar considerations apply to observed scrambling asymmetries predicated over preverbal or postverbal domains, such as in Kural (1997), Kornfilt (2005a). Even though a verb may be lexically specific to have all its arguments on the left side, if the language allows contraposition, CCG would predict potentially unbounded scrambling to the right as well, as in (11) where çocu̇g-u gets the category $S/\text{NP}_{\text{acc}, \text{topic}}$ by (8b). This process can only be limited by the lexical types and modal restrictions (see Baldridge, 2002, for a treatment of Turkish examples such as 10 and 11).


‘You know that I think the man saw the child.’

Hence, the dictum of no predication over the surface structure suggests that (i) the asymmetries originate from the lexicon, be they syntactic or information structural, (ii) the latter must also be specified in the categories because derivations are purely syntactic type-driven, and (iii) the asymmetries cannot be about surface positions.

Below we show the syntactic type-driven derivation of intonational constituents in (1b) without the intonational features to avoid notational clutter, to prove that in CCG they are syntactic constituents with semantic interpretation. We redraw the same example in section 7 where we integrate intonation into grammar to show our proposal at work.
3. The received view: predicting information structure from surface positions and regions

In this section, we provide an appraisal of earlier proposals for interaction of information structure and word order. Some of these work made specific proposals for Turkish, most of which are based on the influential study by Erguvenli (1979); Erk (1983), Hoffman (1995), Işsever (2003), Kiçaçal (1994). Others, such as Vallduví and Engdahl (1996), make general claims about information structure, and Turkish data are used to support the claims.

To exemplify surface-syntactic definitions, we look at Erguvenli (1979), Erk (1983) and Işsever (2003). Erguvenli defines focus as the most information-bearing element in the context, and it is claimed to be signaled by word order, at the immediately preverbal position. Word order variation in her terms carries a pragmatic function in bringing the constituent to this position. She associates topichood with the sentence-initial position, and characterizes the postverbal region of a sentence as hosting the background information.

Erk (1983) partitions an utterance into topic and comment, with further designation of a part of comment as focus. She also distinguishes between the activated versus unactivated status of discourse referents (activation being a psychological state in the addressee’s mind), with the following restrictions: (i) Unactivated topics precede their comments; (ii) the focused constituent is placed at the immediately preverbal position, which is at the same time the location of sentential stress.

Işsever’s (2003) proposal for focus is twofold: contrastive focus (c-focus) and presentational focus (p-focus). These notions make use of accessibility. C-focused elements are accessible from the context, while p-focused elements are not. The difference is captured by positing distinct focusing strategies for different types of foci.

3.1. The dual-strategy account

Turkish is claimed to have (i) stressing in-situ and (ii) moving to (or staying at) the immediately preverbal position, as two distinct focusing strategies (Erguvenli, 1979; Işsever, 2003; Kennelly, 1999; Vallduví and Engdahl, 1996). Let us schematize the problem for easier exposition. We use two conventions throughout the paper for marking the stressed element, depending on the context. One is to use the diacritic \( \hat{} \), the other is capitalizing the stressed element when no confusion arises, as before. ŠOV would be the prosodic strategy, because word order is unmarked. OŚV would be the syntactic strategy.

The assumed ungrammaticality of (13) is attributed to the dual strategy. The judgments are cited author’s.

(13) a. *O kitab-ı Ali-den Ayşe İSTE-Dİ.
   That book-ACC Ali-ABL Ayşe want-PAST

   window-ACC Ali break-PAST
   ‘Ali broke the window.’ (Kiçaçal, 1994)

The ÖSV of (13b) is predicted by the current derivationalist accounts to be infelicitous because the dual strategy delivers conflicting foci (O or S).

We argue that this view is too strong. The markedness of such sentences is due to lack of contextual information. When the appropriate context is supplied, they are perfectly acceptable (14):
These examples cannot be dismissed as nonlinguistic recovery from a contrastive process. A competence grammar must deliver all these interpretations because the same information-structural assumption such as for example the one in (14a) is valid in the following example:

(15) O kitab-i Ali-den Ayşê İSTE-DÎ. ben biliyorum. Alabilmiş mı?
That book-ACC Ali-ABL Ayşê want-PAST I know take-ABL-ASP QUES
‘I know Ayşê asked for that book from Ali. Did she get it?’

To further substantiate the point we offer (16 and 17). Given the uncontroversial acceptability of our examples, and that of cited authors in (17), it appears that the advocates of the dual-strategy need to explain why mixed-strategy sentences do not have double foci, one for the stressed and one for the moved constituent.

celery-ACC you QUES do-PAST-2s much beautiful become-ASP
‘Was that you cooked the celery? It was delicious.’

b. Hayir, PIRASA-YI ben yap-t-u-m. O nasıl ol-muş?
No leek I do-PAST-1s that how become-PAST
‘No, I cooked the leek. What about that?’

child-PLU-DAT Ahmet festival-LOC-REL all film-PLU-ACC

gör-me-ler-i gerek-tiğ-i-ni söyle-miş.
see-N.DER-3p-POSS-ACC necessary-COMP-3s.POSS-ACC tell-PERF
‘It was Ahmet who told the kids that they should see all the films in the festival.’

3.2. The canonical focus position

Göksel and Özsoy (2000) argue that there is no designated focus position in Turkish. They suggest that the sole structural indication of focus in Turkish is stress. No positional restriction can be formulated except that the focused constituent is banned from the postverbal region, and every focused constituent is obligatorily stressed.

3.3. Ground elements

Vallduví (1992) proposes an information structural organization consisting of focus and ground, where ground is further divided into link and tail, roughly corresponding to notions like (contrastive) topic and background (see Steedman and Kruijff-Korbyová, 2003 for a review). There appears to be a consensus about links being obligatorily sentence-initial in Turkish ( Erguvanlı, 1979; Erkü, 1983; Hoffman, 1995; İşsever, 2003; Kılıçaslan, 1994; Vallduví and Engdahl, 1996). Kılıçaslan (2004:730–732) argues convincingly that this claim is too strong, and he points out the
asymmetry between the left and the right periphery. Informationally highlighted material tend to appear in the former. İşsever’s (2003) focus-tail constraint, by which the focus has to precede the tail in utterances consisting of focus and tail, is similarly pointing out a left-right asymmetry. In section 7 we show how both phenomena follow from the syntactic types of boundary tones and pitch-accented/unaccented words.

In summary, we think that the received views on the relation between surface positions and intonation manifest empirical problems. They also need devices or levels extraneous to a lexicalized grammar, such as movement, traces, surface structure, spell-out, or multiple syntaxes, which we believe are not forced moves. (See Steedman, 2006 for dependency and adjacency conditions under which movement and traces would be necessary, rather than taken as theory-internal assumptions. None of these conditions have been attested yet.) What seems to be needed is not one-way determination of information structure from word order but their interaction, including with tunes laid over words. For that purpose we first compile an inventory of pitch accents and pitch contours to relate phrasal intonational structure and information structure.

4. Phonology of Turkish intonation

The relation between prosody and information structure can be roughly characterized as a matter of prosodic prominence. However, not every natural language maintains this prosodic prominence through the same means. Regarding this diversity, Godjevac (2000:14) discusses three types of prosodic prominence: (i) Pitch accent placement, (ii) phonological phrasing, and (iii) pitch range expansion.5

We claim that Turkish makes use of accent placement and phonological phrasing in the encoding of information structure. In what follows, we will be concerned with the following intonational features: (i) Stress, (ii) intonational contour, or tune, comprising of pitch accents and boundary tones, and (iii) intonational phrasing.

It has long been recognized that Turkish has a pitch accent system (Demircan, 1996; Ergenc, 1989; Johanson, 1998; Kornfilt, 1997; Levi, 2005; Lewis, 2000; Nash, 1973; Özsoy, 2004; Selen, 1973; Underhill, 1976; Üçok, 1951; Van Der Hulst, 1991). However, with the exception of Levi (2005), the notion of pitch accent has not been used in the presently established sense, for example in Pierrehumbert and Hirschberg’s (1990) sense, according to which pitch accents represent the movements of pitch associated with the prominent (stressed) syllable of a word (following Bolinger, 1958a, b). One crucial aspect of the current use is that it conceives pitch accent and stress as related but independent notions.

We show that once a thorough intonational description is established, one ends up with a system in which the assignments of stress and pitch accents operate independently to signal the information structural categories of theme and rheme. The system is completed by the additional role played by the intonational boundary events.

We first need to draw a clearer picture of the tune system at our disposal. To this end, section 4.1 and section 4.2 present some tunes and intonation patterns. The speech data is obtained by recording five native speakers of Turkish. Pitch contour analyses are computed by Praat software.6

4.1. An inventory of Turkish phrasal tunes

We follow Pierrehumbert and Hirschberg (1990) and ToBI guidelines (Beckman and Elam, 1997) for intonational description. Pitch accents are designated by H (for high), L (for low) and their combinations. The tone associated with the stressed syllable is designated by suffixing a ‘*’ to the tone. Some typical examples are H*, L* and L+H*.

Following the Pierrehumbert and Hirschberg (1990) model of English intonation, we assume a prosodic organization of intermediate phrases, which are grouped into intonational phrases. Intermediate phrase boundaries are designated by L- and H-, which are distinguished from the intonational phrase boundary tones L% and H%.

We present the tunes below. They are called phrasal tunes by Steedman (2000a:653). We do not claim to be exhaustive in this listing. Our focus is on the prosodic events that are thought to have information structural significance. We demonstrate our findings over the simple declarative sentence (18).7

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5 This is a very simplified view of the phenomenon of prominence, which we assume in the present paper for expository purposes; see Ladd (1996) for an extensive discussion.
7 We chose two words with different phonetic shapes. One word (maymun) ends with a closed syllable, and the other (elmayı) with an open syllable. Their first syllables have different shapes as well.
The first F0 curve is given in Fig. 1a, for (19a). $H^*$ indicates a local maximum associated with the stressed syllable of *Maymun*. $L-$ marks the behavior of the pitch track between the pitch accent and the phrase boundary as a fall. $L\%$ indicates a low boundary tone ending the intonational phrase (*Maymun*) (*elmayı yedi*). Pitch accents and boundary tones are distinct prosodic events (Pierrehumbert, 1980), thus we distinguish them in the notation as well. Fig. 1b presents the same tune stretched over a larger prosodic phrase, (19b).

(18) Maymun elma-yı ye-di.
          monkey  apple-ACC eat-PAST
  ‘The monkey ate the apple.’

The first F0 curve is given in Fig. 1a, for (19a). $H^*$ indicates a local maximum associated with the stressed syllable of *Maymun*. $L-$ marks the behavior of the pitch track between the pitch accent and the phrase boundary as a fall. $L\%$ indicates a low boundary tone ending the intonational phrase (*Maymun*) (*elmayı yedi*). Pitch accents and boundary tones are distinct prosodic events (Pierrehumbert, 1980), thus we distinguish them in the notation as well. Fig. 1b presents the same tune stretched over a larger prosodic phrase, (19b).

(19) a. (Maymun) (*elmayı yedi*).
   $H^*  \quad L-L\%$

   b. (Maymun yedi).
   $H^*  \quad L-L\%$

---

8 In the bottom tier of F0 curves, we show the temporal range of words in vertical lines, without aligning the stressed syllable with the pitch accent. We show the alignments in the text.
The sequence represented as $H^* L-L\%$ is the characteristic declarative tune, which is also called the assertive tune or hat contour. Fig. 1c shows the F0 track of (20). The $L^*$ accent indicates a local minimum in pitch on the stressed syllable of *maymun*.

(20) (Maymun) (elma-YI ye-di.)

\[
\begin{array}{c}
L^* & H^- & H^* & L-L\%
\end{array}
\]

It is not clear to us whether $H^-$ is part of the pitch accent or acts as an independent boundary event. It may be what Büring (1997) calls a “trail tone.” Féry (1993:71–79) argues that phrase accents are superfluous for the description of German; bitonal pitch accents can do the same work (as cited by Büring, 1997:179). This may also be the case for Turkish. These issues need further phonological research. What matters is the fact that a rising contour designated as $L^*H^-$, when borne by a word, marks the right end of a prosodic phrase. Furthermore, this type of boundary should be distinguished from the $L-L\%$ boundary we had in the examples above; $L-L\%$ is more abrupt than boundaries designated by ‘-’ (and it is ensued by a flat contour; see below). This notation will be consistently applied in the remainder of the paper. We mark the intermediate phrase boundaries associated by a fall in pitch as $L^-$. The following examples are for the remaining pitch accents. F0 curves of (21) and (22) are given in Fig. 1d and Fig. 1e, respectively. The same arguments for $H^-$ and $L^-$ hold for these examples as well. Notice that, in (22), the position of stress shifts from the default final syllable to first syllable, which is characteristic of the $H^*+L$ accent.

(21) (mayMUN) (elma-YI ye-di.)

\[
\begin{array}{c}
L+H^* & L^- & H^* & L-L\%
\end{array}
\]

(22) (MAYmun) (elma-YI ye-di.)

\[
\begin{array}{c}
H^*+L & H^- & H^* & L-L\%
\end{array}
\]

We compile the phrasal tunes we identified into two groups in (23). The only A tune appears to be $H^* L-L\%$ for Turkish. Other A tunes are available in English.

(23) **Phrasal Tunes:**

a. A tune: A nonflat tune ending with the $L-L\%$ boundary.\(^9\)

b. B tune: A nonflat tune not ending with an $L\%$.

The rationale behind A–B classification is to capture the difference between a falling boundary and a “continuation rise”. We do not consider the semantics of B tunes in detail. What the name “continuation rise” implies, namely that there is more to come, suffices for our purposes. Pierrehumbert and Hirschberg provide a detailed analysis for English. The association of rises with incompleteness and nonfinality is *almost* a universal phenomenon. However see Gussenhoven (2004:92) and Ladd (1996:ch. 4) for exceptions, and Ladd’s general discussion and criticism of the universalist view of intonation.

4.2. Turkish intonation patterns

Let us consider the intonation patterns comprising phrasal tunes, without claiming exhaustivity. We represent the patterns as sequences of labels A and B.

- **BA**: This is the pattern which is typical of topic-comment style declarative sentences, exemplified above by (20–22).

\(^9\) To be more specific, if Turkish can be regarded as similar to German, then what we call $H^-$ should be incorporated into $L^*$, resulting in a bitonal accent $L^*+H$, instead of a sequence of a pitch accent and a phrase accent such as $L^*H^-$.  

\(^{10}\) This is a slight modification of the terminology of Bolinger (1965). He distinguishes A-accent and B-accent, taking them as unanalyzed wholes of pitch movement. The current replacement of “accent” with “tune” is due to the Pierrehumbertian decomposition of “accent” into pitch accents and boundary tones.
BB: (24) illustrates this pattern (Fig. 2a is the F0 track). Notice that H*L- is a B tune according to (23).

(24) (Maymun) (elmayı yedi.)

H* L- L* L-H%

In contrast to BA examples, this utterance is not complete. The final rise appears to signal that there is more to come by the speaker of (24). In a context where somebody (say Aynur) placed her bets on whether the apple will be eaten by a monkey or an elephant, the speaker of (24) may continue with:

(25) (Aynur iddiayı) (KAYBETTI).

A. bet-ACC lost
   ‘.. and Aynur lost the bet.’

An informal semantics of the rising B tune of BB can be given as follows: It signals that the utterance must be interpreted in relation to some upcoming material.

Example (26) shows that B tunes other than H*L- are possible in BB (see Fig. 2b for the F0 track).

(26) (Maymun) (elmayı yedi).

L* H- L* L-H%

This example is also incomplete. A possible continuation can be:

(27) (MUZU braktı).

H* L-L%

banana-ACC leave-PAST.3s

‘and left the banana.’

AB: This pattern is likewise incomplete. Consider (24) with an A tune on maymun, rather than the H*L-. It cannot mean the monkey ate the apple. It conjoins perhaps the deictic indication that the monkey is what is being talked about, then proceeds with enumerating its activities, more of which is to come. (27) is one way to complete the enumeration.

For convenience, we identify the following prosodic domain as F. It describes an interval in which no prosodic structuring of phrases takes place.

(28) F domain: A low and flat prosodic interval.

In this interval the speaker drops to the bottom of her pitch range after an H* L-L%, and keeps a low and flat line until the end of the utterance. A high and flat prosodic domain in the same position is also possible, which is attested in French (Féry, 2001), but it does not exist in Turkish as far as we can tell.

AF: This pattern has been attested in a diversity of languages, and has been given various names: postfocal deaccenting (Wagner, 1999), dephrasing (Féry, 2001) and destructuring (Büring, 2006). Gussenhoven (2004:87)
describes the phenomenon: “West Germanic languages use pitch accents to mark focused parts of sentences but remove these after the focus (‘deaccentuation’).” (See Ladd, 1996 and Truckenbrodt, 1999 for explanatory accounts of the phenomenon.)

Example (19a) illustrated the pattern, which we repeat here as (29). We represent the flat region by the absence of any indicator of prosodic structure. F0 track is in Fig. 1a.

(29) (Maymun) elmayı yedi.
   \hspace{1em} H^* \ L-L% \\

The effect of postfocal deaccenting can be observed more clearly in longer utterances such as the following (see Fig. 3 for the F0 track):

(30) (Aynur) onların böyle bir yargiya varma-lar-na engel olabil-ir.
   \hspace{1em} H^* \ L-L% \\
   \hspace{1em} A. they-GEN such a judgement-DAT arrive-POSS.3pl-DAT prevent-ABIL-PRES
   ‘Aynur may prevent them from making such a judgement.’

The logically possible patterns BF, FB and FA have not been attested in our experiments. We do not investigate the phonological aspects of the restricted character of F. In section 7 we point out the syntactic asymmetry of having F before or after λ. Phonologically speaking, it seems more appropriate to take it as an effect of the preceding λ tune, rather than as a separate tune. The crucial point regarding this domain is that we have two phonologically distinct regions: An intonational phrase with an H* L-L% contour, and a prosodically “destructured” domain ensuing it.

AA pattern: Consider (31). Unsurprisingly, two assertive tunes within a single clause cause double predication and ungrammaticality. This utterance is acceptable only when considered as two clauses, in which case it should be glossed as It is the monkey; and it ate the apple.

(31) *(Maymun) elmayı yedi.
   \hspace{1em} H^* \ L-L% \ H^* \ L-L% \\
   Intended reading: ‘The monkey ate the apple.’

It is crucial to observe that the speaker completes her utterance by one of the following in BB and AB patterns: BA, A or AF. This is in line with the general observation, mentioned by Krahmer and Swerts (2001:394–395), “that low boundary tones are interpreted as signals of the speaker’s intention to give the turn to the other participant”. We name this observation for future reference as follows:

(32) Incomplete Utterances
    Turkish utterances ending with B tunes are incomplete, in the sense that they require further contribution from the speaker to have a coherent interpretation.\(^{11}\)

In summary, the following intonation patterns have been attested in Turkish, which are put to use toward a single independent predication: A, B, BA, AB, BB and AF.

\(^{11}\) It does not follow from the description that Turkish speakers always end their contribution with an λ pattern, or that conversation collapses when they do not. When a speaker stops after a B tune, the required continuation is accommodated by the hearer in the sense of Thomason (1990), resulting in a Gricean implicature.
5. Tunes and word order

In this section we discuss the relation between the phrasal intonation patterns and word order in Turkish. Before we proceed, we find it crucial to make ourselves clear on the status of tunes in the present framework. We do not take intonation (or accentuation) to be a “freely floating” structure that strands over any sentence regardless of its syntactic makeup, caring only for the prominence of informative elements. We subscribe to the structural view of intonation outlined in Ladd (1996:ch. 5), taking accentuation patterns of a language to be constrained via the syntax-phonology interface. To put it in CCG terms, intonation is just one aspect of the linguistic sign, which is fitted together with other aspects via the syntactic types. These signs in turn are assembled into interpretable constituents through a purely syntactic type-driven combinatory process outlined in section 2.

5.1. Plasticity and Turkish

Vallduví (1991) draws the plastic versus nonplastic distinction in accentuation. Turkish exhibits a fairly plastic intonation in verb-final (XV) constructions. The broad focus accent falls on the direct object in an SOV sentence (33a), and on the subject in an OSV sentence (33b) (brackets indicate focus ambiguity).12 As in the case of English, the nuclear accent can shift away from its default location, resulting in narrow foci (33c–f). Examples (33c) and (33e) are instances of postfocal deaccenting, which we represented above as the Af pattern.

(33) a. [Maymun [[ELMAYI] yedi]].
    b. [Elmayı [[MAYMUN] yedi]].
    c. [MAYMUN] elmayı yedi.
    d. Maymun elmayı [YEDI].
    e. [ELMAYI] maymun yedi.
    f. Elmayı maymun [YEDI].

Besides verb-final orders, Turkish also allows right-displaced constituents to appear to the right of the verbal complex. In contrast to verb-final orders, these orders exhibit nonplastic behavior, given that “no constituent which bears stress can appear postverbally except in fixed constructions such as proverbs.” (Göksel, 1998:103).

The received view concerning the ban on postverbal stress is that this region is reserved for background material, and since focus obligatorily receives the main stress, stressing a postverbal constituent leads to a contradiction in the informational articulation of the utterance. However as Göksel (1998:103) observes “it is not clear whether the unavailability of this [postverbal] position for focus . . . is a result of factors relating to interpretation or phonology.” A reasonable and simplifying assumption at this point appears to be taking what Göksel calls “factors relating to interpretation or phonology” not as referring to two complementary explanations but to two sides of the same syntactic coin. In section 7, adhering to our type-driven lexicalist approach, we model the unavailability of stress to the right of the verb as a syntactic feature restriction on the categories representing rightward displacement in the lexicon, i.e. non-pitch-accenting in the S\(\langle S\langle N\rangle\) types of Turkish. The implication is that the properties of the postverbal region must be mediated by syntactic types. It cannot be a direct relation to phonology or semantics. The constraints on semantics of right-displacement must be type-dependent because of its syntactic properties; witness for example the unbounded instances such as (11). And lack of stress, if it bears on compositional meanings, can only be projected by syntactic types in a radically lexicalized grammar. If the narrow hypothesis of grammatically mediating these properties from the lexicon can be falsified, we can anticipate a stronger empirical base for positing, e.g. a separate syntax for the postverbal region.

The preverbal and postverbal asymmetries noted in the literature are not limited to stress. They extend to binding and scope. The next section discusses these aspects to clarify our agnostic stance regarding the role of surface positions in grammar and in the capture of asymmetries.

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12 The availability of sentence-wide focus in OSV sentences is subject to contextual factors. To get a sentence-wide focus reading for Elmayı MAYMUN yedi, think of the hypothetical context in which it is quite customary that people play bets in a game where the point is which animal will eat the apple, the monkey or the gorilla, and imagine someone asking “What’s the matter?”
5.2. Surface position of the verb and asymmetries

Göksel (1998), Kennelly (2004), Kornfilt (2005a), Kural (1994), Kural (1997) and Temürçü (2001) have argued that there is an asymmetry in binding and scope-taking of preverbal and postverbal constituents in Turkish. The order of preverbal constituents according to them are sensitive to binding and quantifier scope, whereas postverbal arguments are either insensitive (Kornfilt, 2005a) or less sensitive (Kural, 1997).13

Consider the following examples from Kornfilt (2005a). Kural (1997) and Kennelly (2004) agree with Kornfilt that there is an asymmetry of one reading in these kinds of examples (Kural emphasizes “under neutral intonation”). (34a) has the numeral quantifier scoping over the universal quantifier, (34b) vice versa.

(34) a. Üç kişi-ye her kitap-tan Ayşe sözетmiş.
   Three person-DAT each book-ABL A mention-PAST
   ‘Ayşe mentioned every book to three people.’ (Kornfilt, 2005a, ex.11–12)

b. Her kitap-tan üç kişi-ye Ayşe sözетmiş.
   Each book-ABL three person-DAT A mention-PAST
   ‘Ayşe mentioned every book to three people.’

However, these are only preferred readings, as Kornfilt (2005a) and Kural (1997) concede, and other readings are available too. Kornfilt (1998) considers (34b) to be ambiguous, but not (34a). Imagine (34a) uttered in a context where opinion is divided whether some people, Ayşe possibly among them, studies topics with people in groups of different sizes. The numeral quantifier can also take narrow scope in our Turkish in this case, under neutral intonation as well as in contrastive stress. The new information in (34a) is now distributed among üç kişiye and Ayşe, therefore this is not simply contrastive focus. Imagine (34b) uttered in a context where say social workers (Ayşe being one of them) have been known to constantly talk to the same group of individuals about matters, about whom the hearer has no knowledge. The numeral quantifier can also take wide scope in our Turkish, and it is genuine quantification because the hearer does not know about these individuals.

All these readings must be made available by a competence grammar, if we are talking about a generative capacity rather than tendencies. Nonpreferred readings are not nonlinguistic recovery from context, as the following example attempts to show (under the same imaginary context we concocted for 34b).

(35) Ben sen-in her kitap-tan üç kişi-ye Ayşe’nin sözet-tiği ni bil-diğin-i
      I you-2s each book-ABL 3 person-DAT A-3s know-COMP.3s-ACC know-COMP.2s
      san-iyor-du-m.
      think-IMPF-PAST-1s
      ‘I thought you knew Ayşe mentioned every book to three people.’

We agree with Kornfilt (2005a) and Kural (1994, 1997) on the postverbal arguments. There seems to be no asymmetry in the postverbal region. Both examples in (36) are ambiguous in terms of scope.

(36) a. Ayşe sözetmiş üç kişi-ye her kitap-tan.
      A mention-PAST 3 person-DAT each book-ABL
      ‘Ayşe mentioned every book to three people.’ (Kornfilt, 2005a, ex.13–14)

b. Ayşe sözetmiş her kitap-tan üç kişi-ye
      A mention-PAST each book-ABL 3 person-DAT

13 There is also the problem of interactions among pre- and postverbal constituents. We leave the issue to another paper to avoid further digression.
As for the asymmetries in anaphoric binding—namely that order matters preverbally but not postverbally, intonational (hence information structural) factors have a crucial role in acceptability, as first recognized by Kural (1994):

(37) a. Adamları birbirlerini, DÜN görmüş
men-NOM each other-ACC yesterday saw
‘The men saw each other yesterday.’

b. birbirlerini, Adamları, DÜN görümiş
each other-ACC men-NOM yesterday saw
‘The men saw each other yesterday.’ (Kural, 1994, ex.58)

c. *Dünü birbirlerini, ADAMLARı görmüş
yesterday each other-ACC men-NOM saw
Intended reading: ‘The men saw each other yesterday.’

Anaphor’s precedence of its antecedent is not sufficient for ungrammaticality, as (37b) shows. The antecedent must be in focus as well. Similarly, some binding asymmetries in the preverbal region such as (38) observed by Kornfilt (2005a) seem questionable in the light of evidence from the orthogonality of precedence and focal deaccenting. The example becomes grammatical to us and to our informants, when the focal accent does not fall on the antecedent.14

Assuming that a lexicalized grammar is a model of the competence grammar, following the Strict Competence Hypothesis of Steedman (2000b), we are forced to assume also that all constraints on compositional meanings must be resolved by lexical syntactic types, hence intonational structure and information structure should be taken into account in explaining the constraints on binding and scope.

Özge (in press) shows how focus- and linear-order-related effects on pronominal binding can be captured in a type-dependent radically lexicalist account.15 It is based on Steedman’s (2000b) Skolem-term quantification, and the results are readily extendible to quantifier scope and anaphoric binding.

To summarize: We have stated our reasons to doubt an asymmetry in the preverbal or postverbal region to be specified over the surface position of the verb or other items. Lack of such predications are predicted by radical lexicalism and type dependence. Syntactic types can carry information structural features as shown by Steedman (2000a), in contrast to surface positions, which they cannot. Asymmetries in scope-taking, directionality and information structural status of these regions can be lexically specified in a radically lexicalized grammar, such as in Steedman (1999) for quantifier scope, Steedman (2000b), Bozsahin (2000), Karamanis (2000) for gapping, Özge (in press) for pronominal binding, and in the contraposition lexical rule (8) for information structure (see also Steedman, 1987). Our proposed revision for (8b) in section 7 better captures these asymmetries than (8b).

Our feature-based lexical formulation demands a deeper exploration of the postverbal region’s properties. In the rest of this section we discuss some aspects of the postverbal region in Turkish, with the hope that our discussion might

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14 We do not deny that the more neutral form of this utterance is the one where the antecedent precedes the reflexive. There are contexts in which the reflexive-antecedent order is at least equally acceptable, if not favored over the antecedent-reflexive order. One such context is the continuation . . . ama karısına bir bardak su bile doldurmaz (‘. . . but for his wife, he doesn’t pour even a glass of water’). We think that contextual and intonational subtleties are the source of disagreements in the judgments of (38).

15 The data in pronominal binding follows a pattern similar to the quantifier scope and anaphoric binding data discussed above.
provide some impetus for further research. We call these aspects syntactic-phonological and syntactic-interpretive, to emphasize that we take the root of the problem to be grammatical.

5.3. The syntactic-phonological aspects of the postverbal region

Göksel (1998:103) considers the possibility that the impossibility of focus in the postverbal region (PVR) may be due to the unavailability of stress in this region. This view would take the constraint as phonological, and only indirectly informational. Following this line of thinking, one is tempted to draw an analogy between the extraposed constituents in French (Ladd, 1996) and PVR constituents in Turkish. The tonal properties of PVR constituents in declarative utterances is identical to that of right displacement, viz. low and flat, as shown in (39) (Fig. 4 shows F0 tracks):

   H* L-L%
   A. knows A-GEN here before coming where went be-ABIL-COMP-ACC
   ‘Ali knows where Aynur might have gone to before coming here.’

   H* L-L%
   A. prevent-ABIL-PRES such a judgement-DAT arrive-POSS.3pl-DAT they-GEN
   ‘Aynur may prevent them from making such a judgement.’

Following Göksel’s suggestion would render right displacement to PVR as a prosodically motivated surface-syntactic device employed in deaccenting the background constituents, rather than conceiving it as another constraint on the types of the grammar as we do. The source of the constraint in both conceptions is prosodic because it involves non-pitch-accenting, which in our view must be reflected on lexical types because it bears on compositional meanings of intonational constituents and in the alternative view on the syntax-phonology interface. In the latter view, Turkish would have both devices of deaccenting: Nuclear accent shift (English type), and right displacement (French style, without extraposition’s leaving a pronoun behind). In our view, there are no strategies for placement. There are intonational constraints on the right-displaced elements. They would be specified lexically on the leftward-looking types looking to the left from the right, i.e. on $S'(S\backslash NP)$, which indirectly relates to backgrounding because such types are not available with information structural features other than the background.

In an utterance with a broad focus, where deaccenting by accent shift is not available, deaccenting would be attained by right displacement. Consider for example the exchange below with potential pairing of the questions q1–3 with the answers a and b.
Both (40a) and (40b) can serve as an answer to all the questions, where the L*H- marked phrases are accommodated themes. However, only in (40a) the temporal adjunct *ben Aynur’un yanındayken* is deaccented or backgrounded (compare the F0 curves in Fig. 5)\(^{16}\). We shall see in section 7 where we enumerate the grammatical effects of deaccenting in (95) that the left-right deaccenting asymmetry exemplified by the adjunct in (40a/b) forces types to engender potentially unrecoverable ambiguities if the asymmetry is ignored in the purportedly left-deaccented versions of (40b), and we suggest that that is why it is avoided.

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\(^{16}\) The information status of PVR constituents is a complex issue. Observe that the discourse pragmatic notion of “givenness” does not help: *Ben Aynur’un yanındayken* (“While I was with Aynur”) is neither given nor necessarily recoverable from the discourse context. Such kind of new background material is quite common in PVR of news sentences:

(i) Hayırdır, yüzün güliyor?
   Çok sevgim bir arkadaşım geldi bu sabah Adana’dan.
   What’s up, you are all smiles?
   A good friend came *this morning, from Adana.*

On the other hand, Kilicáslan (2004) demonstrates that PVR can host Vallduvian links (aboutness topics). Thus, the discourse property of PVR constituents can only be vaguely characterized, perhaps as supplementary information of no primary importance. Therefore, although they can appear in news sentences we do not take them as rheme. The lack of a coherent informational notion for PVR constituents appears to raise a problem for *direct* association of PVR with discourse-functional features.
Low and flat intonation is not restricted to the PVR. It also occurs due to postfocal deaccenting. Once the position-independent mechanism of postfocal deaccenting is taken into consideration instead of preverbal or postverbal placement, the flat versus nonflat distinction aligns with postfocal versus prefocal distinction. The adjunct in (40b) has nonflat intonation because it comes before the verb and the rheme. Preceding the verb is only a necessary condition for prosodic structuring in Turkish. Flat intonation implies not preceding the verb or the rheme. This can be seen in a variant such as (41) where the flat adjunct precedes the verb and follows the rheme. (Fig. 6 shows the F0 track. We are grateful to the reviewer whose comments led us to the material in 41 and 42.)

(41) (MAYMUN) ben Aynur’un yanında-y-ken elmayı yemiş.
    \[H^\uparrow \text{L-L}^\downarrow\]
    ‘The monkey ate the banana while I was with Aynur.’

We provide below another variant of (40b) where the adjunct is placed between the sentence-initial constituent and the rheme. The same tune is realized, namely \[L^\uparrow H \text{-} L^\uparrow H^\uparrow \text{-} L-L^\downarrow\] (Fig. 7 is the F0 curve). This we believe is further support to the type-dependence of the phenomenon, by which the projection of themes and rhemes via syntactic types would not distinguish between arguments and adjuncts.

(42) (Maymun) (ben Aynur’un yanında-y-ken) (ELMAYI yemiş).
    \[L^\uparrow H \text{-} \text{L-H}^\uparrow \text{-} \text{H-L}^\downarrow\]
    ‘The monkey ate the banana while I was with Aynur.’

5.4. The syntactic-interpretive aspects of the postverbal region

Recall that the utterances ending in B tune are incomplete. The semantic type of the continuation (i.e. whether it is a property, entity, or proposition) depends on the semantic type of the B-tuned phrase. Consider an example:

(43) Anna married . . .

Here, following Jackendoff (1972), the interpretation of Anna married can be taken as an open proposition represented by a lambda term: \(\lambda x.\text{married'}x\text{anna'}\). The candidates for completion are of the type that can saturate the open proposition: \{lenny', manny', john' . . .\}. A possible complete form of this utterance is:

(44) Anna married Manny.

When the rising B tune is carried by a full proposition, the continuation alternatives form a set of propositions. We borrow the following example from Pierrehumbert and Hirschberg (1990:287):

Fig. 7. F0 curve of (42).
Like almost all Turkish substantives, hasta is ambiguous between a noun phrase reading (‘the patient’) and a nominal predicate reading (‘is sick’), with the following semantics:

\[(47)\]

- **a. hasta**
  \[\lambda P. P \text{ patient}^I\]
  - the patient

- **b. hasta**
  \[\lambda x. \text{sick}^I x\]
  - is sick

On the noun phrase reading, (46) creates an expectancy to be completed by a predicate, like the one in (48a), yielding ‘the patient is going to have an operation’. On the predicative reading however, (46) cannot receive the open proposition interpretation in (47b). It has a full proposition interpretation, demanding another proposition to follow. It can be completed by (48b), giving ‘s/he is sick, but not in a life-threatening way’.

(48)  
- **a. \ldots Ameliyat olacak.**  
  operation COP-FUT.3s

- **b. \ldots Ama ölümcül değil.**  
  but life-threatening not

The situation is same with verbal predicates. The following utterance is acceptable only when intended as an assertion of two successive propositions. For an interpretation where the postverbal constituent would be an oblique argument or a locative adjunct of the verb, the specified intonation would be very odd.

(49) (Ahmeti gördüm) (EVDE.)

\[\lambda^* H - H^* L - L\%\]

‘I saw Ahmet; he is home.’

* for ‘I saw Ahmet at home.’

The B-tuned phrase Ahmeti gördüm cannot receive an open proposition interpretation, and the ensuing locative phrase that carries the assertive \(\lambda\) tune causes overpredication. In an utterance with a similar tonal structure where a separate propositional reading of the PVR constituent is not available is unacceptable:

(50) *(Ahmeti gör-dü-m) (AZ ÖNCE).

Ahmet-ACC see-PAST-1s little before intended interpretation: ‘I saw Ahmet just a while ago.’

These observations suggest that what is not possible in Turkish to the right of the matrix verb may be predication, which is closely related to the notion of new information, i.e. rheme. We derive the categories for theme and rheme in

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17 This example was played in a workshop on Turkish intonation. No one in the audience, almost all of whom were native speakers of Turkish, could tell which token of hasta, isolated by Praat from complete utterances, paired with which completion. This fact suggests that the same B tune can lay over different types of constituents.
the next section to reflect these constraints on the grammar. We do not pursue further the relation of these observations to the unavailability of focus or stress in PVR. We hope that all aspects of the asymmetries will be covered by the same explanatory package.

6. Tunes and information structure

We follow Pierrehumbert and Hirschberg (1990), Steedman (1991) and Vallduvi (1992) in taking the information structure as the partitioning of an utterance into informational units in accordance with the speaker’s assumptions about the hearer’s attentional state and knowledge state.

Steedman, following others (2000a:§3, op. cit.), proposes to capture the partitioning along two independent dimensions. These are the binary oppositions of theme versus rheme and kontrast versus background. Theme roughly corresponds to the part of the utterance that links it to the preceding discourse, whereas rheme is the part that moves the discourse forward by contributing novel information. Unlike Steedman (1991), Steedman (2000a), does not employ a separate type inventory for theme and rheme. They are reflected on lexicalized syntactic types as features.

Consider the following exchanges from Steedman (2000b:98). In (52) we have a different theme versus rheme partitioning than (51), with exactly the same tunes in a different order.

(51) a. Well, what about MANNY? Who married HIM?

<table>
<thead>
<tr>
<th>Theme</th>
<th>Rheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>H*</td>
<td>(married MANNY)</td>
</tr>
<tr>
<td>L</td>
<td>L+H*</td>
</tr>
<tr>
<td></td>
<td>LH%</td>
</tr>
</tbody>
</table>

(52) a. Well, what about ANNA? Who did SHE marry?

<table>
<thead>
<tr>
<th>Theme</th>
<th>Rheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ANNA married)</td>
<td>(MANNY)</td>
</tr>
<tr>
<td>L+H*</td>
<td>LH%</td>
</tr>
<tr>
<td></td>
<td>H*</td>
</tr>
<tr>
<td></td>
<td>LH%</td>
</tr>
</tbody>
</table>

The theme can be conceived as a set established by a wh-question. It can be represented as functional abstraction. For example the theme introduced by (51a) is the following in lambda notation:

(53) \( \lambda x. \text{marry}'manny'y'x \)

The theme in (51b) is signaled by the phrase \( \text{married Manny} \) bearing the theme contour \( \text{L+H* LH%} \). This theme presupposes a set of propositions congruent with it, which is called the rheme alternative set (RAS) (see Steedman, 2000a:656–659 for details). This set may look like (54) in a certain context:

(54) \{ marry'y'manny'y'sue' \\
      marry'y'manny'y'mary' \\
      marry'y'manny'y'anna' \}

The rheme of (51b) is \( \text{anna}' \), which is signaled by the phrase bearing the \( \text{H*L-} \). When this rheme is supplied to the theme in (53), they yield (55), restricting the RAS to the proposition expressed by (51b).

(55) \( \text{marry'y'manny'y'anna}' \)

18 The term kontrast first appeared in Steedman (2002), and replaced the term focus which had been used for the same concept until then.

19 Steedman (2000a, b) uses L and H for intermediate phrase boundaries, which we write as L- and H- in our examples.
Steedman (2000b) defines kontrast as marking the interesting part(s) of either information units. Kontrast is distinguished from background by the location of the pitch accent within the theme or rheme, thus kontrast marking applies to individual words that bear the pitch accents. Consider the exchange (56) for kontrast versus background:

(56) a. I know who proved soundness. But who proved completeness? (Steedman, 2000a)

\[
\text{Rheme} \quad \text{Theme} \\
\begin{array}{ccc}
\text{H*} & \text{L} & \text{L+H*} \\
\text{kontrast} & \text{background}
\end{array}
\]

Here, the context provides two themes:

\[
\{ \lambda x. \text{prove' completeness}' x \} \quad \{ \lambda x. \text{prove' soundness}' x \}
\]

namely, someone’s proving soundness, and someone’s proving completeness. The set consisting of alternative themes like (57) is called the theme alternative set (TAS). The theme of (56) restricts this theme by marking the term that differs between the \( \lambda \)-expressions as kontrast, by the L+H* accent. If there were no such alternatives in the context, (56) would be infelicitous. The rest of the analysis is same as the example above.

The implication of Steedman’s (2000a,b) proposal is that the information structural aspects of compositional meanings are type-dependent too, therefore the theme and rheme must be reflected on syntactic types, rather than require a separate combinatory base for surface positions or information structure. The next section derives the semantics of rhemes and themes in Turkish. We show the type-dependence of their projection in section 7.

6.1. The rheme in Turkish

We follow Göksel and Özsoy (2000) in claiming that Turkish does not have a designated focus position, and focus is signaled solely via prosody.20 We claim that focus (i.e. rheme) corresponds to a prosodic phrase which is overlaid by an H* L- contour. We propose the following pretheoretical template for rheme realization in Turkish (V represents a verb for exposition). Only in certain cases the verb belongs to the rheme.

(58) **Turkish rheme realization** (the material between vertical lines represents rheme):

a. \( \ldots |XV| \ldots \)

b. \( \ldots |XI|V| \ldots \)

c. \( \ldots |X| \ldots V| \ldots \)

d. \( \ldots |V| \ldots \)

e. \( * \ldots V| \ldots |X| \ldots \)

Examples (59 and 60) show the cases with pre- and postrheme material. We do not indicate the theme partitions in this section. Every nonrHEME element belongs to the theme.

---

20 Büring (2006) questions the validity of positional accounts of focus for a diversity of languages, arguing that focusing strategies that are classified as syntactic and prosodic can be unified under a prominence/prosody based theory of focus.
Both (59a) and (60a) can be thought of as establishing a rheme alternative set (in what ways these two contexts differ will be made clear in the next section when we discuss themes):

\[ \text{(59) a. } \text{Ahmet’in dün gece ne yap-tiş-i-ni bil-iyor-um.} \]

\[ \text{Ahmet-GEN yesterday night what do-COMP-POSS-ACC know-IMPF-1s} \]

\[ \text{Peki Ali-den ne haber?} \]

\[ \text{But Ali-ABL what news} \]

\[ \text{‘I know what Ahmet did last night, but what about Ali?’} \]

\[ \text{Rheme} \]

\[ \text{b. (Ali) } \text{Aynur-U gördü) dün gece.} \]

\[ L^* \text{ H-} \ H^* \ L-L% \]

\[ \text{Ali Aynur-ACC see-PAST last night} \]

\[ \text{‘Ali saw Aynur last night.’} \]

\[ \text{Rheme} \]

\[ \text{c. (Dün gece Ali) } \text{(AYNUR-U gördü.)} \]

\[ L^* \text{ H-} \ H^* \ L-L% \]

\[ \text{Both (59a) and (60a) can be thought of as establishing a rheme alternative set (in what ways these two contexts differ will be made clear in the next section when we discuss themes):} \]

\[ \{ \text{see’aynur’ali’} \]  

\[ \text{go’cinema’ali’} \]

\[ \text{watch’tv’ali’} \]

\[ \text{namely, the set of course of actions that can be taken by Ali. Then a felicitous answer to either (59a) or (60a) should restrict this set to the rheme Aynuru gördü, i.e. λx.see’aynur’x.} \]

\[ \text{Fig. 8a–d shows the F0 curves of (59b), (59c), (60b) and (60c). It is clear from the F0 curves that, regardless of the position they occupy, the rheme partitions correspond to the intermediate phrase that carries an H*L- contour.} \]

\[ \text{However, information structural partitioning in (59) and (60) is not limited to those indicated in the answers. For example, (60b) is information structurally ambiguous; it serves as a felicitous answer to both (62a) and (62b):} \]

\[ \text{(60) a. } \text{Ali dün gece ne yap-tiş?} \]

\[ \text{‘What did Ali do last night?’} \]

\[ \text{Rheme} \]

\[ \text{b. (AYNUR-U gördü)} \]

\[ L^* \text{ H-} \ H^* \ L-L% \]

\[ \text{Aynur-ACC saw} \]

\[ \text{Rheme} \]

\[ \text{c. (AYNUR-U gördü)} \]

\[ L^* \text{ H-} \ H^* \ L-L% \]

\[ \text{Aynur-ACC saw yesterday night Ali} \]

\[ \text{‘Ali saw Aynur last night.’} \]

\[ \text{Fig. 8a–d shows the F0 curves of (59b), (59c), (60b) and (60c). It is clear from the F0 curves that, regardless of the position they occupy, the rheme partitions correspond to the intermediate phrase that carries an H*L- contour.} \]

\[ \text{However, information structural partitioning in (59) and (60) is not limited to those indicated in the answers. For example, (60b) is information structurally ambiguous; it serves as a felicitous answer to both (62a) and (62b):} \]

\[ \text{(62) a. } \text{Ali kim-i gördü?} \]

\[ \text{Ali who-ACC see-PAST} \]

\[ \text{‘Whom did Ali see?’} \]

\[ \text{b. } \text{Ali ne yap-tiş?} \]

\[ \text{Ali what do-PAST} \]

\[ \text{‘What did Ali do?’} \]
Example (60b) realizes the following partitionings as answers to (62a) and (62b) respectively:

\[
\begin{array}{c}
\text{Rheme} & \text{Theme} \\
\text{a.} & \ldots \, (\text{AYNUR}-\text{U} \, \text{gördü.}) \ldots. \\
& \text{H}^* \quad \text{L-L\%} \\
& \text{Aynur-ACC saw} \\
\text{b.} & \ldots \, (\text{AYNUR}-\text{U} \, \text{gördü.}) \ldots. \\
& \text{H}^* \quad \text{L-L\%} \\
\end{array}
\]

A crucial observation about this type of utterances is that the H* accented preverbal element and the verb are prosodically “molded” together, forming a prosodic phrase bearing the H* L-L\% contour. However, as Göksel and Özsoy (2000:227) observe, the informational ambiguity can be eliminated by altering “the relative degree of stress”. We illustrate the point with two different realizations of (64b) given in Fig. 9.

(64) a. Elma nerede?
     apple where
     ‘Where is the apple?’

b. MAYMUN yedi.
     monkey ate
     ‘The monkey ate it.’

Only (a) in the figure is felicitous as an answer to (64a). The one in (b), which has an emphatic stress on maymun indicated by double H\**, is more likely to occur in a context where eating is presupposed. This illustrates the pattern
Although for simplicity we subsume the phenomenon of emphatic stress under boundary events, on par with the phrase-final rises and pauses, we remain agnostic about the exact phonetic correlates of emphatic stress. What concerns us here is its disambiguating effect on theme/rheme partitioning.

The information structural ambiguity illustrated in (63) has usually been discussed under the term focus projection since Chomsky (1972). In the present account, focus projection is type-dependent. Therefore in (63) there is nothing in the string that will prevent H*-accented rheme Aynur’u (Aynur-ACC) to project that role to the entire constituent Aynuru görüdū via its types. The same applies to a subject-verb sequence, as the nonemphatic version of (64b) demonstrates. However, once the prosodic boundary separating the two informational units is specified – via emphatic stress in the present case – the informational ambiguity disappears. This is due to the lexical syntactic types of the boundary tones, which, when present in the string, pass the information structural features to larger constituents within the same prosodic phrase but not to other phrases, as in (2).

However in (63a), there is no boundary tone as far as we can tell to stop the rightward projection of the rheme. In this case the resolution of the ambiguity might be due to contextual update or interpretive rules such as in Selkirk (1984, 1995) (see Gussenhoven, 1999 for discussion). Another way to capture the narrow rheme reading in syntax without recourse to additional interpretive mechanisms would be to assume, following Göksel and Özsoy (2000), that there are two kinds of accent on the immediately preverbal position: Sentential accent and focal accent, hence the ambiguity. Pending further phonological research to establish this distinction, we remain neutral between the contextual model and the syntactic solution we briefly sketch in section 7.

As we propose to remove the notion of associating information structural units with specific positions, we need to show that the rhyme contour is also at work when the rhyme is at positions other than the immediately preverbal slot. Examples (65b) and (66b) are instances of the pattern in (58c). The F0 curves for these utterances are given respectively in Figs. 10 and 1a.


Rheme

b. (DÜN gece) H* Ali Aynur-u yemeğ-e götür dü. last night L-L% ‘Ali took Aynur to dinner last night.’

Theme

Pattern (58c)

21 See Ladd (1996:200–202) for a discussion of the phenomenon of emphatic stress and its role in distinguishing between narrow and broad focus. See also the discussion in Steedman (2000a:653) on the compatibility of a CCG account with various tonal descriptions.
In both (65b) and (66b), the rheme consists of the intermediate phrase that bears the H*L- contour. In contrast to the cases with a preverbal H* accent, the rhyme partitioning is unambiguous, as expected from the prosodic grouping.

The grammatical versus contextual nature of contrastive/presentational focus for rhemes is another aspect which challenges the dual strategy accounts of section 3.1. A crucial motivation for positing two distinct focusing strategies for a language is that these strategies are thought to realize different types of foci. Kiss (1998) argues for the existence of such distinct strategies in Hungarian and English, where the types of foci are identificational versus informational focus. Roughly, the difference between these two types of foci follows from the difference between the information structurally interpretable features that are licensed in the slots that host the focal elements. In a similar way, İşsever (2003) proposes that the so-called prosodic and syntactic strategies in Turkish correspond to c(ontrastive)-focus and p(resentational)-focus, respectively. For example, the rhyme of (66a) can also be signaled by utterances such as (67):

(66b) and (67) are not discourse equivalent. The rhyme in (66b) is more likely to occur in contrastive contexts. The speaker of (66b) might believe that the RAS her rhyme restricts is enumerable by the hearer, for example:

If such an enumerable RAS were not available, therefore could not be retrieved or accommodated by the hearer, the utterance would be infelicitous. (67) on the other hand is not confined to contrastive contexts. It can also appear in noncontrastive contexts, where RAS is believed by the speaker to be nonenumerable by the hearer.

İşsever (2003), in an attempt to give the surface structural correlates of the semantic differences mentioned above, argued that p-foci are confined to the immediately preverbal position, as they are realized by the so-called surface

---

22 The condition of enumerability of RAS, together with the Gricean notion of maximality, captures both of the notions Kiss (1998) associates with identificational focus (c-focus): Contrastiveness and exhaustivity (more on this below).

23 The expository devices TAS and RAS which we use to characterize the information structural semantics are speaker-oriented. These sets represent speaker’s beliefs about what the hearer knows, rather than what is actually known by the hearer.
A structural strategy that moves other material away from the preverbal focus domain. Göksel and Özsoy (2003) put forth convincing arguments against the existence of semantic differences between c-focus and p-focus in Turkish, which undermines the central motive for positing two distinct focusing strategies. Here we provide further support to the fact that c-focus is not necessarily contrastive in Turkish. Consider the following exchange:

(69) a. Daha önce Berlin’e gitmiş birleri-nin yardım-i-na ihtiyacı-imiz var. more before B-DAT go-REL one-PLU-GEN help-POSS.3s-DAT need-POSS.1p exist ‘We need help from someone who has been to Berlin before.’

b. (AYNUR) (Berlin’e git-ti.) O-ndan rica ed-ebil-im. A B-DAT go-PAST s/he-ABL request make-ABIL-PRES-1s ‘Aynur has been to Berlin; I can ask her.’

b’ (Şirket-ten bir ARKADAŞ) (Berlin’e git-ti.) O-ndan rica ed-ebil-im. firm-ABL one friend B.-DAT go-PAST s/he-ABL request make-ABIL-PRES-1s ‘One of my colleagues has been to Berlin; I can ask her.’

In (69b), the rheme Aynur neither contrasts with other referents, nor exhausts the alternatives, except perhaps for the speaker. Furthermore, as (69b’) shows, the rheme referent need not even be identifiable by the hearer. However, if we situate (69b) in a contrastive context like that of (70), then Aynur becomes contrastive focus.

(70) a. Berlin seyahat-iniz nasıl geç-ti?
   B trip-2pl how pass-PAST
   ‘How was your trip to Berlin?’

b. (AYNUR) Berlin’e git-ti. O-na sor.
   A B-DAT go-PAST s/he-DAT ask
   ‘Aynur has been to Berlin; ask her.’

Similar contextual scenarios can be devised for utterances that are at first glance necessarily contrastive. Then the facts suggest that c-focus/p-focus distinction is contextually determined rather than follow from grammatical features. On the other hand, the conclusion that c-focus structures are more common in contrastive contexts is inescapable. We do not claim that the distinction does not exist, but it does not require two distinct focusing strategies. From now on we use the terms c-focus and p-focus descriptively to explain the reasons.

A striking phonological difference between c-focus and p-focus is that, in the former, due to postfocal deaccenting, focus is a narrow argument or adjunct focus, which is followed by a flat intonation. This phonological setting renders a c-focus more highlighted with respect to the rest of the utterance, compared to a p-focus utterance where the verb is included in the same phrase headed by the focal accent (Krahmer and Swerts, 2001; Wagner, 1999 report experimental support for the same phenomenon in German and Dutch respectively). A c-focus construction is contextually more restricted than p-focus, and thus more marked in the sense of Lambrecht (1996). The same arguments apply to a verb focus, which is narrow as well (template 58e). All these observations lend support for the view, suggested by Göksel and Özsoy (2003), that the issue is related to the presence or absence of focus projection (i.e. ambiguity), rather than two distinct strategies.24

Once the c-focus versus p-focus distinction is associated with narrowness, the interpretive effect of exhaustivity follows from the Gricean notion of maximality, as suggested by Umbach (2004:164). For example, the speaker of (70b) is assumed by the hearer not to “withhold relevant information,” therefore Aynur is assumed to exhaust the alternatives. However, this is “a mere implicature which can be cancelled” (Umbach, 2004:164). The speaker may continue with:

24 İsever (2003) holds that p-focus position can also host a c-focus. This is exactly when the ambiguity of the argument-verb unit is resolved in favor of a narrow focus on the argument.
Finally we exemplify the remaining template (58d): A narrow rheme on the verb:

(72) a. Maymun elmayı ne yaptı?
   monkey apple-ACC what do-PAST
   ‘What did the monkey do with the apple?’

   b. (Maymun elmayı) (YEDİ)
      The monkey ate the apple.
   Pattern (58d)

   c. (YEDİ) (maymun elmayı)
      ‘The monkey ate the apple.’

6.2. The theme in Turkish

L*H- is the theme contour in Turkish. Consider the following exchange:

(73) a. Baba-n telefon-la konuş-uyor.
   father-POSS.2s phone-INST speak-IMPF
   Peki Anne-n ne yap-iyor?
   okay mother-POSS.2s what do-IMPF
   ‘Your father is talking on the phone, then what is your mother doing?’

   Voice
   Theme                   Rheme
   (Annem)                (ARABAYI kullan-iyor.)
   mother-POSS.1s car-ACC use-IMPF
   L* H-                  H*   L-L%
   ‘My mother is driving the car.’

The context established by (73a) can be characterized as the theme alternative set below:

(74) \{ \lambda.P.P father' \}
     \{ \lambda.P.P mother' \}

The speakers are talking about two discourse participants. In (73b), annem (‘my mother’) is the theme, as it forms a prosodic phrase marked by the L*H- contour (see Fig. 11), and restricts the TAS in (74) to the theme:

(75) \lambda.P.P mother'

which in turn presupposes a RAS consisting of the possible actions the mother can take. The RAS is in no way required to be enumerable or finite in this case.
The rheme of (73b), arabayı kullanıyor, is the intermediate phrase that carries the H*L- contour, and restricts this RAS to the proposition conveyed by (73b):

(76) drive'car'mother'

Information structural units do not always coincide with prosodic phrases as they do in the example above. Let us consider (73b) as (77b), this time in a different context:

(77) a. Baba-n-n cip-i kullan-diğ-ni bil-iyor-um da,
father-POSs.2s-GEN jeep-ACC use-COMP.3s-ACC know-IMPF-1s but
Anne-n ne-yi kullan-iyor?'
mother-POSs.2s what-ACC use-IMPF
‘I know that your father drives the jeep, but what does your mother drive?’

The TAS established by (77a) is:

\[
\begin{align*}
\text{Theme} & \quad \text{Rheme} & \quad \text{Theme} \\
(\text{Annem}) & \quad (\text{ARABAYI kullanıyor}) & \\
L^* H- & \quad H^* & \quad L-L% \\
\text{kontrast} & \quad \text{background} \\
\text{mother-POSs.1s car-ACC use-IMPF} & \\
\text{‘My mother drives the car.’} & \\
\end{align*}
\]

(78) \{ \lambda x.\text{drive'}x \text{ father'} \} \\
\{ \lambda x.\text{drive'}x \text{ mother'} \} \\

This is different than (74). We see that the theme of (77b) is split into two parts by the rheme arabayı, resulting in a typical instance of a discontinuous theme in Turkish. Following Steedman, we shall call the part that bears the prosodic marking (L*H- in this case) the theme kontrast, and the part that is deaccented the theme background.

Thematic kontrast differentiates the theme from the alternative themes in the context. In (73) and (77), if themes which differ in the L* accent-bearing arguments were not available in the discourse model (which are λP.P father' and λx.drive'x father', respectively), the answers (73b) and (77b) would be infelicitous.

The separation of kontrast and background of the theme by the intervening rheme in (77b) follows from the constraints which we argued to arise from the syntax-phonology interaction. Consider some alternatives to (77b).

(79) a. *(Kullanıyor annem) (ARABAYI.) \\
L^* H- \quad H^* \quad L-L% \\

b. *(Annem) (kullanıyor ARABAYI.) \\
L^* H- \quad H^* \quad L-L% \\

c. #(ARABAYI) (kullanıyor annem.) \\
H^* \quad L- \quad L^* H- \\

d. #(ARABAYI kullanıyor) (annem.) \\
H^* \quad L- \quad L^* H-
They are ruled out by the type incompatibility of an intermediate phrase such as H*L- and L*H- with non-pitch-accenting required for the right-displaced strings such as *arabayı and *annem, respectively (see section 5.1).25

An alternative is (80), where *annem bears a flat intonation due to postverbal placement. Although it is not strictly ruled out, it is less favored than (77b). This is expected since it fails to theme-kontrast *annem with *babam. Below we discuss cases where thematic kontrast is more strongly required, and its absence would result in infelicity.

(80) (ARABAYI kullanıyor) *annem.
    H* L-L%

Another truth-conditional equivalent of (77b) is (81), where *annem again bears a flat intonation, but this time due to postfocal deaccenting. It is fairly infelicitous in the context induced by (77a).

(81) (ARABAYI) *annem kullanıyor.
    H* L-L%

In isolation one takes it as a correction or contrast, for example:

(82) (ARABAYI) *annem kullanıyor, Cip-i değil!
    car-ACC mother-1s use-IMPF jeep-ACC not
    ‘My mother drives the car, not the jeep.’

There are noncontrastive contexts as well, which license examples such as (82), and rule out (77b) and (80). Imagine a detective interrogating someone whose mother has been involved in an investigation:

    finger prints for we-DAT mother-POSS.2pl-GEN use-REL.3s something-PLU required
    ‘For her fingerprints, we need something used by your mother.’

b. (ARABA-YI) *annem kullan-iyor, on-a bak-abil-ir-siniz.
    car-ACC my mother use-IMPF that-DAT look-ABIL-PRES-2pl
    ‘My mother drives the car; you can check that.’

Constructions like (83b) have been argued to be the product of the prosodic focusing strategy (different from the syntactic one), which gives rise to a contrastive focus in relevant work (c-focus of İsğevar, 2003). We argue that the crucial distinction between the context in (83) and that in (77) concerns their themes rather than their rhemes. (77b) and (80) are about *annem. They provide information about a discourse referent, with the difference that in (77b) the referent is contrasted with another, whereas in (80) it is not. (81) on the other hand is not about a referent. The point of the exchange is to be driven by the mother. In this respect *annem is informationally grouped with the verb kullanıyor, which is confirmed by the prosodic grouping.26

Consider now a slightly different example. (84b) would be characterized as a product of the so-called surface structural strategy, by which the subject Annem would move to (or be left at) the preverbal position, the purported focus position. However, exactly the same argument we provided for (77) applies to (84), capturing the surface order without recourse to different strategies.

25 Notice that the intended intonations in (79c and d) have an L* accent on the right-displaced item, and this needs to be distinguished from a final rise signaling disbelief or interrogative mood. In the latter case the examples would fail to be complete declarative utterances.

26 Once again observe that neither of the interpretive notions associated with c-focus, namely enumerability and exhaustivity, arise in the example context. This, we think, shows that the issue is complex, involving both contextual and grammatical aspects that fall beyond what a feature such as [+contrast] can handle.
The two contours $H^*+L$ $H^-$ and $L^+H^*$ $L^-$ mark thematic-kontrast. The first one appears to give partial information (Büring, 1997 identifies the same function with $L^*H^-$ in German). The F0 curve of (85b) is given in Fig. 12.

‘I know who drives the jeep, but who drives the car?’

\[\begin{array}{ccc}
\text{Theme} & \text{Rheme} & \text{Theme} \\
\hline
(Arabay-i) & (ANNEH) & \text{kullan-iyor.} \\
\end{array}\]

\[\begin{array}{ccc}
\text{kontrast} & \text{background} & \\
\text{car-DAT} & \text{mother-GEN use-IMPF} & \\
L^*H^- & H^* & L-L^% \\
\end{array}\]

‘My mother drives the car.’

The L+H* L- is the contour of correcting a proposition about an already established theme (Fig. 13 is the F0 curve):

(85) a. Siz-in-ki-ler nerede?
you-GEN-REL-PLU where
‘Where are your parents?’

\[\begin{array}{ccc}
\text{Theme} & \text{Rheme} & \text{Theme} \\
\hline
(ANNEM) & (ARABAYA biniyor.) & \\
\end{array}\]

\[\begin{array}{ccc}
\text{kontrast} & \text{background} & \\
mother-POSS.1s car-DAT get on-IMPF & H^*+L H^- & H^* L-L^% \\
\end{array}\]

‘My mother is getting on the car.’
The verb cannot bear any of the theme accents in complete declarative utterances. The exchange below shows that the Turkish verb cannot carry a rising pitch accent the way the English verb does in the example (Marcel PROVED) (COMPLETENESS):

(86) a. Maymun-un muz-u yeme-si-ne neden ızın ver-din?
    monkey-GEN banana-ACC eat-POS-DAT why  permission give
    ‘Why did you let the monkey eat the banana?’

    \[
    \begin{align*}
    \textit{Theme} & & \textit{Rheme} \\
    \text{b. (Maymun) (ELMA-YI ye-di) } & \\
    \text{monkey} & & \text{apple-ACC eat-PAST} \\
    \text{L+H* L-} & & \text{H* L-L%} \\
    \text{‘The monkey ate the apple.’} & \\
    \end{align*}
    \]

Consider a setting in which a verb needs to be marked as a corrective theme. Suppose that the hearer of (88a) contradicts the speaker in believing it was the students not the professors who applauded. Then (88c) would be a more cooperative and felicitous answer than (88b), which bears a declarative tune on the entire phrase. The corrective L+H* L- tune is applicable only after the predicate \textit{alkışladı} in (88b) is relativized to \textit{alkışlayanlar} in (88c).

    Marcel-GEN which result-ACC predict-REL-POS3s-ACC know-IMPF-1s
    But which result-ACC prove-PAST
    ‘I know which result Marcel predicted. But which result did he prove?’

b. *(Marsel ispatla-di) (TAMLIĞ-1).
    Marcel prove-PAST completeness-ACC
    L* H- H* L-L%
    Intended reading: ‘Marcel proved completeness.’

Consider a setting in which a verb needs to be marked as a corrective theme. Suppose that the hearer of (88a) contradicts the speaker in believing it was the students not the professors who applauded. Then (88c) would be a more cooperative and felicitous answer than (88b), which bears a declarative tune on the entire phrase. The corrective L+H* L- tune is applicable only after the predicate \textit{alkışladı} in (88b) is relativized to \textit{alkışlayanlar} in (88c).

(88) a. Profesör-ler-in alkışla-ma-si-na çok sıçar-dı-m.
    professor-PLU-GEN applaud-ANOM-POSS-DAT very be surprised-PAST-1s
    ‘I was very surprised that the professors applauded.’

b. *(ÖĞRENCİ-LER alkışla-di.)
    student-PLU applaud-PAST
    ‘The students applauded.’

(88) a. Profesör-ler-in alkışla-ma-si-na çok sıçar-dı-m.
    professor-PLU-GEN applaud-ANOM-POSS-DAT very be surprised-PAST-1s
    ‘I was very surprised that the professors applauded.’

b. *(ÖĞRENCİ-LER alkışla-di.)
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    ‘I was very surprised that the professors applauded.’

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    ‘I was very surprised that the professors applauded.’

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    ‘I was very surprised that the professors applauded.’

b. *(ÖĞRENCİ-LER alkışla-di.)
    student-PLU applaud-PAST
    ‘The students applauded.’

Once a predicate is relativized it can bear any of the theme accents discussed above, presumably because Turkish subordinate predicates are nominalizations.
We show next that intonational items bearing compositional semantics are part of the grammar. The enforcement of the intonational constraints and informational constraints will be syntactic type-driven, not tune-driven, as in all restrictions on compositional meanings and constituents.27

7. Proposal: word order as constraint interaction

The following list is a compilation of our findings. We indicate on the right which section addressed the analysis that led to the generalization.28

(89) Information structure, surface order, tunes and boundary tones in Turkish grammar:

a. The rHEME is signaled by the H*L- contour. §6.1

b. L*H- is the theme contour. The thematie-kONTRast is signaled by B-tuned phrases. §6.2

c. The final tune in a complete declarative sentence is A, followed only by an F. §4.1–§4.2

d. The lexical categories of boundary tones: L- := SS\{S\{NP\} : λf,f'f

H- := SS\{S\} : λf,θθf

L% := SS\{θ,β\} : λf,θf

e. The categories of pitch accents: H* decorates the item in the string with ρ (rHEME) feature. §6

L* decorates the item in the string with θ (theme) feature.

f. The revised lexical rule of rightward NP contraposition: NP → S\{S\} (β for background) (>T<; §5)

These constraints translate to type restrictions on Turkish information structure, constituent structure and phrasal intonation structure. Since everything projects from the lexicon in CCG, they can be thought of as recipes for deciding on the lexicalized syntactic types because the grammar is the sole locus of arbitrating the constraints. Given that constituent structure and word order are inextricably related in CCG (see Baldridge, 2002; Bozsahin, 2000; Steedman, 2000a for more elaboration), with formal predictions about word order typologies (McConville, 2006), it follows that all kinds of constiuencies and word order phenomena with compositional semantics must emanate from type-driven syntax.

The list of constraints is also the basis of a model to systematically integrate the autosegmental-phonological component presyntactically. No grammatical role is ascribed to the prosodic domains Λ, Β or F, or to regions.

(89a–c) are generalizations to determine the information features of lexical types in (89d–f). Therefore all type assignments are lexical or presyntactic. There is no predication over the position of the verb. The lexical category of the transitive verb is taken as S\{NP\}. The syntactic type of verb classes is the CCG correlate of a basic word order in a language. Independent motivation for this category can be found in Baldridge (2002), Bozsahin (2000), Hoffman (1995).

In (89d), the intermediate phrase boundaries L- and H- map rHEME and theme onto intermediate phrases, mark them as such by i (for intermediate), and place the INFORMATION feature of the syntactic type in semantics. Step-by-step composition of semantics of information structure which we glossed as φ', ρ', θ' in (89d) treats them as identity functions λx.x with semantic side effects. For the INFORMATION feature we follow Steedman (2000a), which in our case ranges over the values θ, ρ, and β. The i is compatible only with itself, ensuring that intermediate phrases can only combine with likewise complete intermediate phrases.

All the lexical items in the string that are not presyntactically associated with a pitch accent by (89e) carry the variable η for the INFORMATION feature, which unifies with any other value, which we suppress in derivations for

27 We are grateful to one reviewer who brought up this point of clarification. We believe these points also address the reservations of Hendriks (1999) and Kruijff (2001) against CCG, who criticized that it allowed free hypothesizing about information structure (e.g. with or without derivational positions). It does not allow derivational constraints or conditions on surface word order, as we show in section 2 and section 7.

28 We do not import the recent developments in CCG’s slashes – modalities – to these types; see Steedman and Baldridge (in press) for modalized CCG. Modal restrictions on the slash provide finer lexical control over the syntactic behavior of items. For example, our current thinking is that the categories in (89d) bear the most restrictive modality to eliminate compositions over incomplete intermediate phrases, e.g. SS\{\} SS\{NP\} for L- (similarly for others). (89f) would bear the least restrictive modality.
simplicity. The lexical rule (89f) is strictly type-dependent, not position-dependent or structure-dependent. It simply says that the type $S \setminus (S \setminus NP)$ is information structurally restricted wherever it occurs, unlike the type-raised varieties $S \setminus (S \setminus NP)$ and $S \setminus (S \setminus NP)$ engendered by universal rules (3e and f), which are not so restricted. The variable $\beta$ unifies with values other than $\rho$ and $\theta$, that is, it is compatible with itself and $\eta$.

We model the boundary tone L% with a type which maps (possibly sequences of) intermediate phrases (designated by $i$) onto intonational phrases (designated by $f$), implementing the hierarchical prosodic structure of an utterance. We take $\phi$ as a complex feature bundle. Besides its prosodic effect, it passes to semantics a value related to the finality and completeness of an utterance, which we designate by $\phi'$ in the semantic interpretation (89d).

We model postfocal deaccenting via the category of L% as well, whose result carries $\beta$ for the INFORMATION feature, which means that once this phonological phrase is encountered to signal finality, it can only combine either with accentually unspecified items ($\eta$) or with backgrounded/deaccented items ($\beta$), due to L%’s result type and (89f).

7.1. Examples of interaction

We now show how these restrictions shape the syntactic types in a derivation, by exemplifying the derivations of (73b), (77b), (84b), (1b) and their variants, which have been discussed in detail in section 6.2 and in the introduction. These examples are chosen to demonstrate the cases in which $H^* L^-$’s rheme marking ($\rho$) falls on items other than the verb, and to highlight the type-driven ambiguity of focus projection. Simpler cases of $\rho$-marking on the verb such as (72) can be handled similarly. We assume TAS and RAS sets are available as per questions of the examples.

(90) is the type-driven derivation of (73b). $H^*$ is aligned by the autosegmental-metrical component presyntactically, with the most prominent syllable of arabayı (similarly, $L^*$ is aligned with annem). $H^*$ is a lexical item ending a $B$ tune. Its syntactic type requires theme-marking ($\theta$) for the preceding intonational phrase, which is a reflection of (89b). $H^*$ as part of an $H^* L^-$ tune is rhyme-marking (89a), which is culminated by the syntactic types of $L^-$ and L% (via 89d) to form $H^* L^- L%$, therefore the word bearing it carries the rhyme ($\rho$) feature.

\[
\begin{array}{c}
\text{(Annem)} \\
\text{Mother-POSS.1s} \\
S_\theta/(S_\theta \setminus NP_{\theta,\text{nom}})^T \quad \text{S}_\rho/(S_\rho \setminus NP_{\rho,\text{acc}})^T \quad S/(S_\theta \setminus NP_{\theta,\text{nom}})^T \quad S/(S_\rho \setminus NP_{\rho,\text{acc}})^T \\
S_\theta \setminus (S_\theta \setminus NP_{\theta,\text{nom}})^T \quad \text{S}_\rho \setminus (S_\rho \setminus NP_{\rho,\text{acc}})^T \quad S \setminus (S_\theta \setminus NP_{\theta,\text{nom}})^T \quad S \setminus (S_\rho \setminus NP_{\rho,\text{acc}})^T \\
: \lambda \rho, p \ast \text{mother'} \quad : \lambda \rho, \theta f \quad : \lambda \rho, p \ast \text{car}' \quad : \lambda \rho, \rho f' \quad : \lambda \rho, \theta f \quad : \lambda \rho, \theta f'
\end{array}
\]

The verb’s syntactic type bears no specific theme-rheme features due to (89e). It does not carry a pitch accent (cf. the theme marking of the English verb in 2). Its information structural feature bears the variable $\eta$. The last line of the derivation shows the normalized logical form where the semantics of $\rho', \theta'$ and $\phi'$ are reflected on LF objects (see Steedman, 2000a for the mechanism).

The same scheme applies to (84b), which involves syntactically unorthodox surface constituents. We show a fragment of its derivation in (91), in which the intonational constituent annem kullanıyor is derived as a syntactic constituent without extra assumption (we shall at the end of this section propose a way to narrow the rheme). In this example, the role of rhemehood is reversed with respect to (90). $H^*$ has the same effect on the subject that it did on the object in (90). $L^-$ and L% as lexical items make no appeal to the subject, object or the verb in their syntactic types, as before.
Other constraints act on Turkish syntax as well to shape the lexical syntactic types. One obvious source is morphology, which is reflected simplistically in our examples, such as the accusative case in the type \(NP_{\text{acc}}\). Other sources are syntactic constructions, such as gapping and subordination, including relative clauses. Subordinate clauses are strictly verb-final in Turkish, and if forward gapping is relatively free in word order as suggested by Bozsahin (2000), Kornfilt (2005b), but backward gapping is not, because of *SO & OSV, and *OS & SOV (independent of whether it is an instance of gapping or node-raising; see Hankamer, 1972 for discussion), then this evidence corroborates further that Turkish must be basically verb-final, with other orders bearing nondefault intonational features as suggested by (89f). 29

The lexical types are projected onto phrasal syntax monotonically, therefore a lexical rule such as rightward contraposition (89f) has to bear noncontrastive features, which we write with \(\beta\) marking. The rule is a type-dependent capture of the fact that right displacement implies backgrounding. As we have shown in (7–9), the right-displaced constituents are forced to use the type \(S \backslash (S \backslash NP)\) in the verb-final basic word order assumption, and this type is only available with \(\beta\) features. (89f)’s \(\beta\)-decorated type ensures that in surface word orders such as Annem kullanıyor arabayi, there is no lexically or presyntactically licensed type for arabayı that can bear a theme or rheme marking (\(\rho\) or \(\theta\), and be compatible with the type \(S_{\phi,\beta} \backslash (S_{\phi} \backslash NP_{\beta})\). The theme and rheme are associated with prosodic structuring via H* and L* in (89e):

\[
\begin{align*}
(S_{\phi,\beta} \backslash (S_{\phi} \backslash NP_{\beta})) & \xrightarrow{L\%} S_{\phi,\beta} \backslash (S_{\phi} \backslash NP_{\beta}) \\
& \xrightarrow{\beta} S_{\phi,\beta} \backslash (S_{\phi} \backslash NP_{\beta}) \backslash \text{arabayı}
\end{align*}
\]

‘My mother drives the car.’

The example also shows the joint postfocal deaccenting effect of L\% and right displacement. L\% marks the result syntactic type with \(\beta\), which is only compatible with \(\eta\) or \(\beta\). Any material to the right of L\% has to be compatible with these features, as in the rightward contrapositive type of arabayı.

In (93) we illustrate further how our lexical types capture postfocal deaccenting via the type of L\%, without reference to the verb or its position.

\[
\begin{align*}
(S_{\phi,\beta} \backslash (S_{\phi} \backslash NP_{\beta})) & \xrightarrow{L\%} S_{\phi,\beta} \backslash (S_{\phi} \backslash NP_{\beta}) \\
& \xrightarrow{\beta} S_{\phi,\beta} \backslash (S_{\phi} \backslash NP_{\beta}) \backslash \text{yedi}
\end{align*}
\]

‘The monkey ate the apple.’

Unlike (92), L\% does not follow the verb in this example. Elmayı does not bear \(\rho\) or \(\theta\) features because it is not aligned with H* or L* (89e). \(\eta\) is borne by the verb yedi for the same reason. If the material past L\% were yedi elmayı, \(\beta\)

\[29\] From this perspective, we consider purely formal proposals for explaining the word order behavior, such as that of Kural (2005) where alternative tree traversal algorithms from computer science do all the work on word order (e.g. preorder, postorder and inorder traversal), not likely to lead to an explanation of the three-way interaction.
features on \emph{elmayı} would be relevant (89f), by which the entire substring \emph{yedi elmayı} would still be postfocal-deaccented in its syntactic type due to the rightward contraposition’s $\beta$ feature and the verb’s $\eta$ feature. Notice that the only role the verb plays in information structural marking is via its syntactic type, just like other lexical items in the string. Thus the common view of deaccenting in the postverbal region is rendered as the joint effect of syntactic types of (i) L\%, (ii) rightward contraposition, and (iii) lexicalized word order, all of which are part of the lexicalized grammar, not of surface configurations.

The types in (89d–f) spell an asymmetry in deaccenting pointed out by Kılıçaslan (2004) and İsever (2003), and exemplified earlier in the contrast of (40a) and (40b), repeated here as (94a and b).

(94) a. (Maymun) (ELMAYI yemiş) ben Aynur’un yanında-y-ken.

\begin{verbatim}
L* H-   H*   L-L%
\end{verbatim}

monkey apple-ACC eat-PAST I Aynur-GEN near-COP-while

‘The monkey ate the banana while I was with Aynur.’

b. (Ben Aynur’un yanında-yken) (Maymun) (ELMAYI yemiş.)

\begin{verbatim}
L* H- L* H- H* L-L%
\end{verbatim}

As (92) and (93) showed, the $\lambda$ tune has the effect of destructuring the post-$\lambda$ region by insisting to combine to the right only with items carrying $\beta$-compatible features ($\beta$ and $\eta$). The pre-$\lambda$ material, e.g. the sentence-initial material, will be “information-structured” if it is an intermediate ($i$) phrase, as in (94b), because L\% takes as input type complete $i$-phrases on the left (89d). Therefore the sentence-initial material in (94b) must be in the scope of L\%’s type because otherwise L\% combines first without the $i$-phrased material on the left to yield a $\phi$-phrase, say [(Maymun) (ELMAYI yemiş)]$_{S\phi,T}$ to which an $i$-phrased left material cannot attach. If the pre-$\lambda$ material (say X) could be prosodically unstructured (as an $\eta$-phrase), which is not possible in our Turkish, it would be underspecified with respect to which information structure it joins, as shown schematically below with two potential types for a left-peripheral X:

\begin{verbatim}
Assuming Y to be a prosodically structured domain, X$_{\eta}$ could be incorporated as part of a complete phrase ($\phi$), rhyme or theme. We suggest for further inquiry that Turkish resists sentence-initial deaccenting to avoid this spurious ambiguity. The same argument applies to the focus-tail asymmetry pointed out by İsever (2003). The type-driven account of the pre-$\lambda$ region subsumes İsever’s constraint that in the focus-tail utterances the focus precedes the tail.

Let us return to (1) as another demonstration of constraint interaction. Consider that example as (96) below in light of the grammatical constraints in (89).

(95) The type possibilities for the potential deaccenting of X to X$_{\eta}$ on the left periphery:

\begin{verbatim}
 Assuming Y to be a prosodically structured domain, X$_{\eta}$ could be incorporated as part of a complete phrase ($\phi$), rhyme or theme. We suggest for further inquiry that Turkish resists sentence-initial deaccenting to avoid this spurious ambiguity. The same argument applies to the focus-tail asymmetry pointed out by İsever (2003). The type-driven account of the pre-$\lambda$ region subsumes İsever’s constraint that in the focus-tail utterances the focus precedes the tail.

Let us return to (1) as another demonstration of constraint interaction. Consider that example as (96) below in light of the grammatical constraints in (89).

(96) a. Ben, kapt-yi ALI kIr-di zanned-iyor-du-m.

\begin{verbatim}
I  door-ACC A  break-PAST think-LMPF-PAST-1s
\end{verbatim}

‘I thought Ali broke the door.’

b. HayIr, (PENCERE-YI) L- H-

\begin{verbatim}
No  window-ACC  door-ACC  break-PAST
\end{verbatim}

\begin{verbatim}
S_p/  (S_p \setminus NP_{t,acc})/  (S_p \setminus NP_{t,acc} \setminus NP_{t,nom})

S_{t}(/(S_{t} \setminus NP_{t,acc} \setminus NP_{t,nom}))
\end{verbatim}

(1): ‘No, Ali broke the window, and Mehmet, the door.’
Window and Mehmet in (96b) are part of the same rhyme because they bear H*L- tunes, not A tunes. (There is one A tune, which is on the intonational phrase that includes Mehmet.) This is predicted by (89a). Ali and door are theme-contrasts bearing B tunes (89b). These are reflected in their syntactic types presyntactically by L* (the combination kapıyı H- is not shown to save space). Window is the object, and Ali is the subject, which are reflected in their types by case morphology. (We can also think of morphological case as an independent lexical item that combines with a stem, following Bozsahin (2002), in which case some types above would be combined in the derivation.)

Window’s H* spells ρ features for its result type because although a theme-contrast implies bearing B tunes (89b), the reverse is not necessarily true. (Note that H*L- is a B tune.) The B tune on the window is a result of ρ features because it is not part of the theme, viz. Ali due to the context (96a). The intonational phrase (Mehmet kırdı) bears ρ features because of H* on Mehmet, and L- makes it an intermediate phrase with i (see 12 for the semantics of 96b).

7.2. Focus projection and narrowing

Node raising, “backward gapping” or ellipsis analysis of (96b) remains unresolved. There is in CCG a way to analyze the example as constituent coordination, i.e. as X and X where X’s are like types. (The coordinator’s category is lexicalized to (X\X)/X in Steedman and Baldridge (in press); it is the combinator Φ.) It uses a reanalysis rule called category decomposition by Steedman (2000b), related to backward application. The rule does crucial work in forward gapping analysis of English, Dutch, German (Steedman, 2000b), Turkish (Bozsahin, 2000) and Greek (Karamanis, 2000), and for the lack thereof in Japanese (Steedman, 2000b; Bozsahin, 2000). It is also known to adhere to CCG’s universal principles, and avoids “anti-gapping” in English (Steedman, 2000b) and Turkish (Bozsahin, 2000). White and Baldridge (2003) compile the rule into lexical categories therefore in principle it can be lexicalized.

We revise the rule below to incorporate intonational phrasing. Steedman’s proposal that the left material in the decomposed category is a theme (with semantics θ̅) remain unchanged (cf. themehood of kapıyı in 96b).

\[
(97) \ X_i; \ left' \rightarrow S_i/S_j; \ θ̅, left' \ X_i/(S_i/S_j); \ λy.left'
\]

(<<)

Notice that the rule’s controversy arises from its nondeterminism. It does not rely on derivational history (the finitely schematized S/S is revealed independent of history). It is not position-dependent either. It is type-dependent (see Steedman, 2000b:§7.3 and White and Baldridge, 2003 for discussion). The revision proposes that the conjunct revealed by (97) originates from intermediate phrases (i) to combine with likewise intermediate phrases (cf. the H- at the end of the left conjunct in 96b):

\[
(98) \ a. \ (Dexter \ eats \ bread), \ (and \ Warren,) \ (potatoes). \quad \text{Steedman (2000b:190)}
\]

b. *(Dexter eats bread). (And Warren,) (potatoes).


Example (96b) now follows from (97) as constituent coordination with parallel type-driven constituency of intonational phrases, information units and syntactic constituents, as in (99). Coordination analysis of (99) is empirically sound. If we were to use the focus particles da (‘too’) or ise (‘but’), both of which are second-position clitics with conjoining semantics, the string would be Pencereyi Ali, kapıyı da/ise Mehmet kırdı, i.e. the particles would be in the right conjunct, which is where the coordinating category is revealed by (97).
Decomposition nondeterministically reveals new categories. It does not reassign categories to strings already derived. Hence intonational phrasing is respected, and no record of derivational history is needed. The ambiguity it engenders arises from its nondeterminism and its oblivion to the subrange of string positions of the revealed categories. As CCG’s most cherished principle is the Principle of Adjacency which effectively eliminates type bearing of phonologically null strings (Steedman, 2000b) to ensure the lock-step assembly of semantics, neither of the revealed categories can fall on the empty strings, therefore the possibilities of type-to-substring correspondences are linearly bounded by the size of the reanalyzed substring. Full consequences of these limited liberties await further research.

The verb in (99) cannot be to the left of conjuncts, not because of the information structural features, but because of the forward directionality of the syntactic types of conjuncts, which is shown in the fourth line of the derivation (the application of ‘F’ for coordination). If the verb is to appear at the end of the first conjunct to lead to forward gapping (98c), which is as good an answer to (96a) as (96b), we expect the contrast in the judgments of (98c and d) to hold, which is also implicated by (89c).

The forward variety of (97) we propose below can be assumed to have a role in capturing the scope ambiguities associated with focus projection we discussed in the context of (63), if we were to follow the syntactic solution to focus projection without recourse to contextual update.

\[
\begin{align*}
(100) \quad X_i: & \text{ right’ } \rightarrow X_i/S_j; \text{ } \lambda y.\text{right’ } S_i/S_j; \text{ } \eta’ \text{right’ } \\
\end{align*}
\]

The rule reveals a theme or rheme background on the right (with semantics \( \eta’ \), which is a placeholder for the semantics of themes or rhemes, i.e. for \( \theta’ \) or \( \rho’ \)), in effect narrowing the left material which is either a theme or rheme (because of the \( i \) feature). Its narrowing effect can be seen in the reexamination of (99) as (101), where the verb \( \text{kırdı} \) is also possibly theme-background, hence the rheme \( (\text{Mehmet kırdı}) \) is narrowed. This analysis also maintains like-category coordination. (L%’s category is not shown to save space; it incorporates \( \iota \)-phrases to \( \phi \)-phrases in the last line of the derivation.)

\[
\begin{align*}
(101) \quad (\text{PENCERE-YI L- Ali}) \text{ H-} & \quad (\text{kap-yi) H-} & \quad (\text{MEHMET H-} & \quad (\text{kr-dr.) L-} & \quad \text{L%}
\text{window-ACC} & \quad \text{door-ACC} & \quad \text{break-PAST} & \quad \text{L%}
\end{align*}
\]
The semantics of narrowing which we glossed as \( \theta'_l \) in (97) and \( \eta' \) in (100) are essentially syntactic type-driven semantic side effects. We note that the part which gets to apply this semantics is always a predicate with some arguments, i.e. \( S_i/S \) where \( l \) is either \( \backslash \) or \( \slash \), but not \( S_i/S \) which would cover propositions as well. This observation we believe might reconcile the argument-structure based restrictions on focus projection, in which Schmerling (1976), Gussenhoven (1992), Selkirk (1984) claim that the argument can project focus to predicate, which presupposes that there is an argument in the intonational phrase to do that, and the view of Steedman (2000b) where LF restrictions apply to rules such as decomposition, which amounts to a semantic restriction on focus projection. We are currently investigating these aspects.

The narrowing effect of (100) can also be seen in the derivation of (Arabayı kullanıyor) in (90) as (102) below. This example corresponds to (77b), and it also shows that decomposition is not a coordination-specific rule. The same effect of the deaccenting asymmetry due to nuclear accent (no unaccenting before nuclear accent, deaccenting after nuclear accent) has been reported for Bengali (Hayes and Lahiri, 1991:exx. 23a–g), English (Steedman, 2000b:107–109) and French (Féry, 2001:167/171). No leftward-deaccenting tendency is observed in intonational phrases, e.g. in Bengali (Hayes and Lahiri, 1991:exx. 23a–g.).

(102) (Annem) H-
Mother-POSS.1s
\[ \frac{S_0/(S_0/\text{NP}_{o,nom})}{S_i/(S_i/\text{NP}_{r,nom})} \]

(\text{ARABAYI})
\[ \text{car-ACC} \]

(\text{use-IMPF})
\[ S_i/(S_i/\text{NP}_{r,\text{nom}}) \]

(77b): “My mother drives the car.”
It is possible that (100) is only relevant for revealing theme backgrounds, and rhyme-backgrounding must always align the left material with the nuclear accent, that is, it must be done by a different rule or type assignment (see, e.g. Komagata, 1999, which introduces extra syntactic types to handle the incremental semantics of contrast and background via structured meanings). This issue awaits further research.

The rules in (97/100) satisfy CCG’s universal principles, and they can be formally justified because they are specializations of the application rules (3a and b) in the reverse direction of the arrow. They also respect the pre-A and post-A deaccenting asymmetry we captured via syntactic types: Prerheme materials are intermediate phrases whereas postrheme materials are not, therefore postrheme material cannot undergo category decomposition hence do not show information structural ambiguity. Leftward and rightward decomposition cannot co-occur in the same intonational phrase either because of the i restriction and the lexicality constraint (‘/$’ or ‘n$’), which would otherwise cause complete deaccenting in the intermediate phrase.

Applying both decompositions in the adjacent intermediate phrases, e.g. to the intermediate phrases (A) (B), would reveal configurations of the sort ⟨A/C C = D\(\backslash\)D⟩⟨D/D = F B\(\backslash\)F⟩, assuming maximally compatible types across (A) and (B) as the worst cases of interference. A is forward-decomposed, and B backward. Alternatively they could yield ⟨A A\(\backslash\)A⟩(A/A A), where A is backward-decomposed and B forward (assuming B=A for maximum compatibility). Both ‘D\(\backslash\)D/D/D → D\(\backslash\)D’ (or D/D\(\backslash\)D’), and ‘A/A A→A/A A (or A/A)’ as potential points of interference are universally disallowed by the principles of CCG, therefore interaction of decomposition across intermediate phrases is impossible.

Focus projection needs a syntactic story which must not only accommodate ambiguities but conservatively generate them too, and decomposition is a syntactic type-driven way of doing that. Incremental semantic restrictions are expected in a theory such as CCG where semantics go in lock-step with syntactic derivation, thus it seems that proposals that appeal to the dynamically derived predicate-argument structure for constrained behavior (e.g. Prevost, 1995; Komagata, 1999; Steedman, 2000a,b, and ours) stand in contrast to relying on the extra interpretive postsyntactic rules for focus (e.g. Selkirk, 1995). A contextual update model might also reveal other aspects that we do not foresee at the moment.

Although both focus projection and rightward displacement receive type-dependent analyses in our account, we treat grounding instigated by rightward displacement as a phenomenon which is separate from focus projection (the domain of focus projection via decomposition is t-phrases, and b-phrases are not t-phrases). The correlations in the three-way association of word order variation, information structure and intonational structure suggest self-organizing differences in radical lexicalism. Turkish word order and prosody spell certain types, e.g. deaccenting associated with S\(\backslash\)(S\(\backslash\)NP\_nom) types and backgrounding. English word order and information structure make other associations, e.g. topicalization and its relation to S\(\backslash\)(S\(\backslash\)NP) versus S\(\backslash\)(S\(\backslash\)NP), as in This book I like versus *went home Harry and Barry (Steedman, 1987). Hence the question is not whether word order variation and information structure should be kept in some grammars and left out in others, it is the resolution of type restrictions spelled out by word order, intonation and information structure, if these facts bear on compositional meanings.
8. Conclusion

Tunes, boundary tones and pitch accents have compositional semantics that bear on truth conditions and information structure, as work by Pierrehumbert and Hirschberg (1990), Rooth (1992), Steedman (2000a) showed, among others. Word order variation and the constituencies engendered by it bear on compositional meanings too, and we have shown that the three aspects, information structure, intonational structure and word order correlate in Turkish, rather than determine one way or the other. Our findings in this regard are as follows (the term (dis)placement is used in the empirical sense only): Accenting implies theme, rhyme or contrast. Postrheme placement implies deaccenting. Right displacement implies backgrounding. Backgrounding and deaccenting imply each other. Preverbal and prerheme placement imply accenting. The narrow hypothesis is to start with a single locus of grammatical meaning composition, that is, with a radically lexicalized grammar, and assume that all constraints on compositional meanings bear on a single aspect of grammar, the lexicalized syntactic types.

Having a single base for grammar, adjacency, seems to eliminate the need for stipulations about surface positions, levels and their linking, and for multiple syntaxes that do essentially the same task: Compositional meaning assembly. This way we can narrow down the possible grammars while adding to the predictive power of a theory of grammar, including the following: The notion of “possible lexical items” arising from types, conditions for multiple predication – therefore constraints on single predication – arising from the interaction of intonation and information structure, compositional semantics of tunes, subtle information structural distinctions in syntactic asymmetries such as forward versus backward gapping, a single modeling tool to formulate grammatical asymmetries (type-dependence, rather than dependence on word order, positions or notional formulations such as verbs, nouns, themes, rhemes, links or tails), basic word order assumptions and their consequences, the syntax-phonology interaction such as pitch accent-syntactic category relations, the cross-linguistic ambiguity of focus projection, postfocal deaccenting, and the grammatically relevant deaccenting asymmetries.

For example, (a) in a tone language such as Chinese, the tones would not be lexical items themselves as in (89d), because they are lexical properties of words, hence they would not be as free to play an information-structural role in syntax as they do in English or Turkish (Mark Steedman, p.c.), which narrows down the possible lexical items in Chinese grammar. (b) Cross-linguistically, there would be no need for lexical type assignments to informational elements, e.g. theme := ..., or rhyme := ..., precisely because their compositional semantics are syntactic-type-driven, therefore they must be part of the syntactic type, i.e. they must be on the other side of ‘:=’. (c) Incorporation of the effects of the pitch accents into a syntactic derivation such as in (89e) would not be universal. A language can find other means to start up the delivery of prominence, with concomitant results on its projection. For example, Féry (2001) suggests that in French pitch accents and lexical stress do not do the work on prominence. It is achieved by clefting (104a), fronting (104b) and special phrasing (104c).

(104) a. C’est Arnim qui a escaladé la montagne.  
   C’est la montagne qu’Arnim a escaladée.  
   Féry (2001:162)  
   ‘Arnim has climbed the mountain.’
   b. Arnim, il a escaladé la montagne.  
   La montagne, Arnim l’a escaladée.  
   c. Arnim a escaladé la montagne.  
   Arnim a escaladé la montagne.

Respectively, (a) the head of the syntactic construction, (b) the lexical rules such as (8a) and syntactic types of weak and resumptive pronouns, and (c) the boundary tones – which are present at the beginning and the end of a special phrasing according to Féry – would decorate the syntactic types with information structural features (see Biskri, 1995 for a CCG analysis of the syntactic aspects of dislocation in French).

When we take intonation as consisting of tunes and prominence, that is, as a structured domain, and manage to model it as a different aspect of the same derivational structure that yields the information structure as Steedman (2000a) does (rather than conceiving it as another structured level of representation), then considering intonation as a fundamental constraint acting on lexical syntactic types – therefore on grammar – seems natural. Anything that bears a syntactic type is part of the grammar, and the implication of current work is that some intonational elements must be in the Turkish grammar, namely boundary tones and pitch accents (the former has lexical categories, and the latter is...
introduced by type-dependent lexical rules), otherwise some constituencies in Turkish and their compositional semantics arising from the interaction of syntactic, semantic, phonological, intonational and informational constraints are unaccounted for.

Intonational and informational aspects seem to narrow down the possible combinatorial (i.e. syntactic) categories in all languages that have been studied from this perspective, whatever the current hypothesis is about their surface grammar. That is why they must be part of a theory of grammar.

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