31 Prosodic encoding of information structure: A typological perspective

Frank Kügler & Sasha Calhoun

31.1 Introduction

Information structure (IS) can be conceived of as a 'cognitive domain' that interacts with the linguistic modules syntax, phonology, and morphology on the one hand, and, on the other hand, with other cognitive capabilities that control, update and infer interlocutors' common beliefs (Zimmermann & Féry 2010). A speaker's utterance can be subdivided according to its IS, and the constituents of an utterance can be analysed as being *focused*, *given*, and/or *topical*. Interlocutors use different linguistic means to achieve the goal of controlling, updating and inferring their common beliefs. This chapter deals with the prosodic means that speakers use to signal the IS of an utterance from a typological perspective.

At first sight, it may appear that languages vary widely as to which prosodic cues signal IS (cf. Jun 2005b, 2014; Kügler 2011; Downing & Rialland 2016a). However, within prosody and IS research, it has recurrently been proposed that this variation in the prosodic realization of IS can be subsumed by underlying principles which point to common phonological structures present cross-linguistically (Truckenbrodt 1995; Büring 2010; Féry 2013). Another line of research concerns the debate whether there is a relationship between the prosodic profile of a language and its prosodic means to express IS (cf. Burdin et al. 2015). This chapter is organized around the different prosodic strategies to express IS found to date in the languages of the world (section 31.3), including interactions between syntax, prosody and IS (section 31.4); leading up to a discussion of commonalities between languages (section 31.5). Section 31.2 introduces the basic concepts of IS, and section 31.6 presents an evaluative outlook for future research.

31.2 Basic concepts of information structure

We adhere to the widely held view that the basic notions of IS are the cognitive categories *focus*, *givenness* and *topic* that are rooted in a theory of communication (Krifka 2008). IS refers to the division of an utterance in information packages (Chafe 1976) with the aim of a continuous information update of the common ground of interlocutors. The category *focus* is defined as an indication of 'the presence of alternatives that are relevant for the interpretation of linguistic expressions' (Krifka 2008: 247). This abstract cognitive category can be prosodically expressed in language-specific ways. Consider the mini-dialogue in (1). Speaker Q's WH-question is a request to update the common ground with the referent of the WH-word. Speaker A responds by selecting the referent *Peter* as the relevant one of the possible alternatives in the context. This constituent is the focus and receives a pitch accent in languages like English, whereby the location of the pitch accent is given in upper case. The rest of the utterance is the *background*. The focused constituent in the answer corresponds to the WH-constituent in the question, thus creating a coherent discourse.

(1) Q: Who stole the cookie?
A: [PEter]$_F$ stole the cookie. (Krifka 2008: 250)

A further use of focus is to correct or confirm information that an interlocutor puts under discussion, as in (2). In this case, context (2C) contains a proposition containing potential focus alternatives. In (2A), the speaker corrects (2C), while (2A') contains the identical proposition.

(2) C: Mary stole the cookie.
A: (No,) [PEter]$_{F}$ stole the cookie!
A': Yes, [MAry]$_{F}$ stole the cookie. (Krifka 2008: 252)

In (1), the focus is also new information in the context, and the background given. However, *givenness* is actually orthogonal to *focus* in that a focused constituent can either be *given* or *new*, which represent either ends of a givenness scale. *Givenness* refers to the information status of a constituent. A constituent is *given* if it is present in the immediate common ground (Krifka 2008: 262), or *new*, if it is not. A further, intermediate stage of the givenness scale is when the constituent is present in the common ground but may or may not be activated by the immediate discourse. In some languages, different degrees of saliency correlate with the degree of prosodic prominence a constituent is expressed with (see further section 31.3.1). The example dialogue in (3) for instance shows a case where speaker A mentions the *cookie* and speaker B repeats the same word in the answer. The givenness status of *the cookie* affects accent assignment rules in some languages (Gussenhoven 1983; Selkirk 1995). The deaccentuation of *cookie* in combination with a focus accent on the verb constitutes discourse coherence and illustrates that a given constituent is expressed with less prosodic prominence.

(3) A: I know that John stole a cookie. What did he do then?
B: He [reTURNED [the cookie.]$_{Given}$]$_{Focus}$ (Krifka 2008: 264)

Finally, the category *topic* refers to a constituent of an utterance that a speaker chooses to give further information about in the rest of the sentence, which is usually referred to as the *comment* (Krifka 2008: 264f). A topic in this sense is usually referred to as an *aboutness topic*. The division of a sentence into topic-comment opens a relationship between the information conveyed by the *topic* and the information given about the *topic*. Taking the answer of the cookie example (1) as a context-free sentence, (4) illustrates that *Peter* represents the *topic*, and the following information in the *comment* is about the topic constituent *Peter*.

(4) A: [Peter]$_{Topic}$ [stole the cookie.]$_{Comment}$

The key IS categories are illustrated here in English, which relies heavily on prosodic cues to express IS. Note however that across languages linguistic devices other than prosodic means are used to express these information structural categories (Zimmermann & Féry 2010; Féry & Ishihara 2016). By far the prosodic expression of *focus* is most studied, but we discuss the expression of *givenness* and *topic* when possible. In many studies, the category of *focus/background* is conflated with referential status of *new/given*. We comment on work that separates these when relevant.

31.3 A typology of prosodic encoding of information structure

31.3.1 Stress or pitch accent-based cues

Stress-based systems are the most well-studied type of prosodic encoding of IS, with decades of research, predominately on English. The basic pattern is that the focused word in an utterance is the most prosodically prominent (e.g. Selkirk 1995; Ladd 2008; Büring 2010, 2016; Calhoun 2010). Stress-based prominence is marked by phonetic and phonological cues which increase the prominence of a word relative to others in the utterance. Phonetic cues include higher fundamental frequency (f0), greater f0 movement, lengthening, increased intensity and higher spectral tilt on the word, as well as a drop in f0 after it (see summaries in Ladd 2008; Breen et al. 2010; Fletcher 2010; Turk 2011). Of these, f0 cues are the best studied and are perceptually important (see review in Cole 2015, and references therein).

Intensity and lengthening are also perceptually important, at least in English (Turk & Sawusch 1996; Kochanski et al. 2005; Breen et al. 2010).

<insert Figure 31.1 here>

Figure 31.1: Typical realisations of (1) and (4), showing how focus position affects prosodic realisation. A schematic pitch realization is given, along with the prosodic phrasing, intonational tune, and text, where capitals indicate the pitch accented syllable. See text for further details.

Phonologically, a word is the most prominent in an utterance because its main stressed syllable is the head of the largest prosodic phrase that it is part of (usually the intonation phrase, ι) (Ladd 2008). The head of the ι-phrase carries a nuclear pitch accent. Therefore, as established by work in the Autosegmental-Metrical (AM) framework, focus is not marked directly by phonetic cues, but rather indirectly: these cues primarily mark (nuclear) pitch accents, which mark focus (Selkirk 1995; Ladd 2008; Büring 2010, 2016; Calhoun 2010, inter alia). This is opposed to a *direct* view, where focus is taken to be marked directly by phonetic prominence (Eady et al. 1986; Xu & Xu 2005; Breen et al. 2010). Figure 31.1 illustrates typical realisations of (1) and (4). Each utterance has a prosodic phrase structure (phonological phrases, φ, and ι-phrases, shown), and an intonational tune (according to the AM-ToBI scheme, see chapter 4 this volume). The nuclear accent is, by default, the final pitch accent in the ι-phrase, hence on the focus *Peter* in Figure 31.1a, and *cookie* in Figure 31.1b. This is supported by perception studies, which show that listeners expect the nuclear accent, and therefore the focus, will be final, and that a final nuclear accent is compatible with variable focus scope (Ayers 1996; Terken & Hermes 2000; Carlson et al. 2009; Bishop 2012, 2017).

Pre-nuclear pitch accents may or may not mark additional foci in the sentence (Féry & Samek-Lodovici 2006; Calhoun 2010), e.g. the H* accent on *Peter* in Figure 31.1b does not. The prominence of pre-nuclear accents can also signal the distinction between broad and narrow focus; although there is substantial overlap between realisations compatible with each (Rump & Collier 1996; Ladd 2008: Ch. 7; Breen et al. 2010). Post-nuclear phonological heads are either not associated with pitch accents, i.e. they are 'de-accented', or if there are accents they appear in a compressed pitch register (Kügler & Féry 2017). Fully-fledged post-nuclear accents mark focus only in constrained discourse contexts such as second occurrence focus (see Beaver et al. 2007; Baumann 2016).

Stress-based marking of focus appears to be widespread amongst the world's languages. It is ubiquitous amongst Germanic languages (Fanselow 2016), e.g. English, German (e.g. Féry & Kügler 2008), Dutch (e.g. Gussenhoven 2004) and Swedish (e.g. Bruce 1977; Myrberg & Riad 2016). Stress-based marking is also commonly found in Slavic languages (Jasinskaja 2016), including Russian (Luchkina & Cole 2016), and other Eastern European languages including Romanian (Manolescu et al. 2009), Greek (Baltazani & Jun 1999; Skopeteas 2016), Romani (Arvaniti & Adamou 2011) and Estonian (Ots 2017). Stress-based focus marking is also reported for Persian (Sadat-Tehrani 2007; Hosseini 2014), the Oceanic language Torau (Jepson 2014) and Paraguayan Guaraní (Clopper & Tonhauser 2013).

<insert Figure 31.2 here>

Figure 31.2: Lebanese Arabic (a) and Egyptian Arabic (b) realisation of narrow focus on the initial subject, from Chahal & Hellmuth (2014). As can be seen, post-focal words are deaccented in Lebanese Arabic, but not Egyptian Arabic.

There are differences in the extent of stress-based marking of focus, however, even between closely related languages, or varieties of one language. For example, Chahal & Hellmuth (2014) report differences between Lebanese and Egyptian Arabic (see also Caron et al. 2015, and El Zarka 2017 for an overview of varieties of Arabic). In Lebanese Arabic, a narrowly focused word is nuclear accented, and any post-nuclear material deaccented (see Figure 31.2a); similar to English (see Figure 31.1). In Egyptian Arabic, every prosodic word (ω) is pitch accented, and there is no post-nuclear deaccentuation, although the pitch range of the focal accent is expanded (see Figure 31.2b). Romance languages are similar: some, including European Portuguese and Mexican, Argentinian, Basque and Canarian varieties of Spanish follow the standard stress-based pattern; whereas others including Madrid Spanish, Catalan and Italian only use *in situ* stress-based marking in some discourse contexts, e.g. contrastive focus, and post-nuclear accents are not deleted (Frota & Prieto 2015b; del Mar Vanrell & Fernández-Soriano 2018); see further sections 31.3.3 and 31.4. Along with stress-based marking, focus can usually also be signalled by word order, and this interacts with prosodic cues to focus (see section 31.4.). However, in the standard case, *in situ* stress-based marking, i.e. the nuclear accent can be in any position in the utterance, is an available, if not the preferred, means of marking focus (cf. Skopeteas & Fanselow 2010).

As discussed in section 2, referential givenness is orthogonal to focus; although focus and newness are correlated. In studies which separate focus and givenness, givenness is generally associated with lower stress-based prominence and/or deaccenting, both inside and out of focused constituents (e.g. Cutler et al. 1997; Baumann 2006; Féry & Kügler 2008; Baumann & Riester 2012; Cole et al. 2010; Baumann & Kügler 2015). As shown in (4), in English and other Germanic languages, within a multi-word focus, if the final word is highly contextually salient, it is usually deaccented (Wagner 2005; Ladd 2008; Riester & Piontek 2015). Similarly, given words in the *background* (non-focus) of an utterance are more likely to be unaccented than new words (Gussenhoven 1983; Selkirk 1995; Féry & Kügler 2008). Listeners typically find it harder to process discourses in which given items are accented, and new items unaccented (Cutler et al. 1997; Baumann & Schumacher 2012). Most of the empirical work in this area has been on Germanic languages, so it is unclear how widespread these patterns are. The tendency to deaccent given words within a focus, e.g. (4), is found for Slavic languages (Jasinskaja 2016) and Paraguayan Guaraní (Burdin et al. 2015), but not in Romance languages (Ladd 2008; Swerts et al. 2002), or 'outer circle' varieties of English including Indian English and Caribbean English (Ladd 2008). Given words have lower prominence than new in unfocused positions in Hungarian (Genzel et al. 2015), but not Egyptian Arabic (Hellmuth 2011).

Types of nuclear accent or tune

Along with the placement of the nuclear accent, the pitch accent and/or boundary tone type is argued to play an important role in encoding IS in a variety of languages, particularly aspects of IS beyond focus, principally contrast and topic status.

One well-studied case is Romance languages, where there is widespread consensus that the nuclear accent + boundary tone configuration signals broad versus narrow/contrastive focus (see Frota & Prieto 2015b for overview); with the exception of French (see section 31.3.2.). A typical example is Sardinian (del Mar Vanrell et al. 2015). In broad focus, the nuclear accent

is usually H+L* (Figure 31.3a), while in narrow focus it is H*+L (Figure 31.3b), both followed by a low boundary L%. That is, the nuclear accent peak is aligned earlier in broad focus. In these languages, pre-nuclear accents are generally of one tonal type (L+H* in Figure 31.3), while nuclear accent (and following boundary tone) types vary and signal IS and other pragmatic meanings.

<insert Figure 31.3 here>

Figure 31.3: Broad focus (a) and contrastive focus (b) in Sardinian, from del Mar Vanrell et al. (2015).

Relatedly, in English and other Germanic languages, it is widely claimed that contrastive foci are typically marked by L+H* accents, with H* for non-contrastive focus (e.g. Pierrehumbert & Hirschberg 1990; Ito & Speer 2008; Watson et al. 2008). The L+H* and H* distinction, has, however always been problematic, as it is difficult for annotators to make, and is the only accent type distinction not based on the association of L and H tones. The most reliable cue to the distinction is peak height (Ladd & Schepman 2003; Dilley 2005; Ladd 2008; Calhoun 2012; Repp 2016), which is experimentally confirmed for English (e.g. Welby 2003; Breen et al. 2010; Katz & Selkirk 2011), Dutch (Krahmer & Swerts 2001) and German (Braun 2006; Kügler & Gollrad 2015); suggesting this is better construed as a stress-based distinction. Similar arguments have been made about Romance languages, i.e. the later peaks for narrow focus are also often higher (e.g. see Figure 31.3), so peak alignment may be a partial proxy for peak height (Gussenhoven 2004; Ladd 2008: Ch. 5; del Mar Vanrell et al. 2013; Borràs-Comes et al. 2014; Repp 2016). It remains unsettled whether distinctions based on peak scaling are gradient or categorical (e.g. Gussenhoven 2004; Ladd 2008: Ch. 5; Borràs-Comes et al. 2014).

A connected issue is lack of consistency between studies as to what constitutes *contrastive focus*: narrow focus (focus on a single word); contrastive (involving contextually identifiable alternatives); or corrective (cf. (2)) (e.g. Repp 2016). It seems unlikely that any one language systematically distinguishes all of these prosodically. Rather, it may be that speakers use increased phonetic prominence to draw attention to foci that are contextually salient, e.g. explicit contrast or corrections (Baumann et al. 2006; Calhoun 2009; Féry 2013).

In a number of languages, topics and foci are associated with different accent types: rising accents (L+H*/L*+H) for topics and falling for foci (H*+L/L-), e.g. German (e.g. Braun 2006; Repp & Drenhaus 2015), English (Büring 2003; Steedman 2014), Russian (Alter & Junghanns 2002), and Arabic (El Zarka 2017). This is linked to sentence position, with topics typically preceding foci. Calhoun (2012) claims for English the distinction is better construed as one of relative prominence, with topics less relatively prominent than foci (see also Féry 2007).

Some proposals link a greater range of tonal event types with more detailed IS frameworks (see also chapter 29, this volume). For example in English, Steedman (2000; 2014) proposes four orthogonal dimensions of IS, signalled by combinations of pitch accent and boundary tones: background/contrast (our focus), theme-rheme (roughly topic-comment), added/not added to the common ground, speaker/hearer claimed (see also Brazil 1985; Pierrehumbert & Hirschberg 1990; Gussenhoven 2004; Féry 1993 and Grice et al. 2005 for German; and Prieto 2015 for related work on Romance). It is unlikely, however, that there is a one-to-one correspondence between phonological tune types and IS expression (e.g. Féry 2008; Féry & Ishihara 2016; Hirschberg et al. 2007; Zimmermann & Féry 2010).

The role of accent and boundary tone type in signalling IS has predominately been researched in languages with post-lexical pitch accents. However, they may have a role in other languages. For example, in Mandarin Chinese boundary tones on sentence final particles can signal meanings such as presupposition, which are part of IS (e.g. Peng et al. 2005, and references therein).

31.3.2 Phrase-based cues

The expression of focus by phrase-based cues first received more attention when research beyond well-studied languages like English contributed to the field. The basic insight is that the word-prosodic system of these languages predominantly does not have lexical prominence and hence focus cannot be expressed by pitch accenting as in languages with stress-based cues. The principal intonation units are phrase tones, and prosodic phrasing is the major component of intonation. The languages differ with respect to the domain that prosodic phrase markings indicate, e.g. a ω, a φ-phrase or an ι-phrase, but the general commonality of these languages is that focus induces additional phrase boundaries. Hence, the highlighting function of focus is expressed by separating the focused constituent from other constituents; at the same time, post-focal constituents may be integrated into the same phrase as the focussed constituent.

Consider Korean which neither has lexical pitch accent nor lexical stress (cf. Jun 2005a). Korean distinguishes two levels of phrasing. The ι-phrase dominates at least one accentual phrase (α), and an α consists of at least one ω. Each α is tonally marked by two rising pitch patterns. The first one is associated with the initial two moras of the α and the last one with the α-final moras (5b). There is some variation as to the initial rise: if the α-initial consonant is tense or aspirated the α-initial tone is H (Jun 1998, 2005a). Phrase-final lengthening in combination with a low boundary tone demarcates the ι-phrase, whereas the α shows no final lengthening.

A prosodic boundary is consistently inserted before a focused constituent (Jeon & Nolan 2017; Jun & Kim 2007; Jun & Lee 1998; Yang 2017), while following words tend to be in the same φ as the focused constituent (5c).Jeon & Nolan also observe a tendency for the focused constituent to be more likely realized as an ι-phrase. In addition, all researchers showed that the focused constituent was realized with higher phrase-initial pitch, longer duration, and higher intensity. In this sense, Korean overlaps with languages that use stress-based cues to mark focus (see section 31.3.1). However, one may interpret these cues as a phonetic effect while focus phrasing may be phonological (cf. Jun & Lee 1998).

(5) a. miɾaneka neil tʃənjəke bananaɾɨl məkniɴte
mira.family.GEN tomorrow night banana.PL eat.PROG
'Mira's family is eating bananas tomorrow night.'
b. phrasing in broad focus
((LH LH)φ (LH LH)φ (LH LH)φ (LH LH)φ (LH L)φ L%)ι
c. phrasing in narrow focus, e.g. focus on second φ-phrase
((LH LH)φ (LH L)φ L%)ι

(Korean, Jun & Lee 1998; prosodic phrasing is our own)

For the Bantu language Chichewa, Kanerva (1990) analyses the effect of focus as an insertion of a prosodic boundary at the right edge of a focused constituent. Bantu languages are known for phrase-penultimate vowel lengthening. In (6a), the penultimate vowel of the phrase-final noun *mwála* 'rock' undergoes lengthening. In (6), focus within a VP takes the verb as the left edge of the prosodic phrase until the right edge of the focused constituent (Kanerva 1990:

157). Any following unfocused constituents form each their own prosodic phrasal domain (7c/d). For a more complex analysis of the interaction of focus and prosodic phrasing in Chichewa see Downing et al. (2004) and Downing & Pompino-Marschall (2013), who however base their analysis on speakers of a different variety of Chichewa.

(6) a. VP focus: What did he do?
(Anaménya nyumbá ndí mwáála)φ
he hit the house with a rock
'He hit the house with a rock.'
b. PP focus: What did he hit the house with?
(Anaménya nyumbá ndí mwáála)φ
c. Object focus: What did he hit with the rock?
(Anaménya nyuúmba)φ (ndí mwáála)φ
d. Verb focus: What did he do to the house with the rock?
(Anaméenya)φ (nyuúmba)φ (ndí mwáála)φ
(Chichewa, adapted from Kanerva 1990: 156)

Languages thus differ as to where a phrase boundary is inserted: While in Korean a boundary left of the focus is inserted, in Chichewa it is at the right of the focus. Further languages which show similar phrasing patterns under focus are French (Féry 2001; Jun & Fougeron 1995, 2000), Japanese (Beckman & Pierrehumbert 1986; Venditti et al. 2008), Georgian (Skopeteas & Féry submitted), Shingazidja (Patin 2016), and Xhosa (Jokweni 1995; Zerbian 2004).

31.3.3 Register-based cues

Another strategy in a number of languages is that IS affects the pitch register. Pitch register defines reference lines relative to which local tonal targets are scaled (Clements 1979; Ladd 2008). This type of cue is similar to stress-based cues in that it involves increasing the prominence, particularly pitch scaling, of the focused element, and/or it involves the reduction of prominence by compressing the post-focal pitch register; however, this is not achieved through pitch accenting, as these languages generally do not have post-lexical pitch accents. It is also similar to phrase-based cues, in that they also frequently involve pitch scaling, however, in the case of the languages discussed in this section, this is not straight-forwardly related to phrasing (though see further section 31.5).

In Mandarin, the pitch register effects under focus are well-studied (Xu 1999; Chen et al. 2016). Two prosodic effects occur, both of which preserve its lexical tones. First, the focused word exhibits a change in f0 that depends on the lexical tone: compared to broad focus, maximum f0 for H tones is raised, including the beginning of HL and the end of LH; while minimum f0 is lowered for L tones, including the end of HL and the beginning of LH. That is, there is a register expansion affecting both the top-line and the bottom-line of the register (Xu 1999:69), in addition to an increasing duration (Chen 2006; Chen & Braun 2006). Second, the f0 after the focused word is lowered, named post-focus compression (PFC) (Xu 1999; 2011; Xu et al. 2012).

Hindi likewise is best characterised as using register-based cues to mark focus prosodically. In this case, there is minimal effect of focal raising, but clear post-focal compression (Patil et al. 2008). In Figure 31.4 compression can be seen on the object in SOV order and the subject in OSV order, with only a small raising on the focused subject in SOV order. The register effect thus appears post-focally and correlates with givenness in Patil et al. (2008). Post-focal compression also functions as a cue to focus perception (Kügler submitted). Other languages that seem best described as register-based are West Greenlandic (Arnhold 2014), Georgian (Skopeteas & Féry submitted), Jaminjung (Simard 2010: 214ff), Serbo-Croatian (with post-

focal compression similar to Hindi) (Godjevac 2005), and Akan, with a general register lowering effect of focus, even for lexical H tones (Kügler & Genzel 2012).

<insert Figure 31.4 here>

Figure 31.4: Time-normalized pitch tracks in different focus conditions in Hindi, based on five measuring points per constituent, showing the mean across 20 speakers. SOV (left) and OSV word order (right). The comparisons of interest are subject focus (dotted line) and object focus (dashed line) with respect to broad focus (solid line); from Patil et al. (2008: 61).

As for topics, a thorough study on the effects of focus and topic in Mandarin revealed that while topic raises the f0 register at the beginning of the sentence, after the topic f0 drops gradually (Wang & Xu 2011). Hence there is no post-topic compression unlike for foci. The amount of topic raising differs from that of focal raising.

31.4 Syntax-prosody interaction and non-prosodic marking systems

In many languages, syntax is an essential means to encode IS, affecting word ordering and the choice of syntactic construction (see Féry & Ishihara 2016). In many of these languages, there are alignments between prosodic and syntactic encoding of IS, leading to proposals that syntactic encoding of IS is often prosodically motivated. Languages may use a syntactic *focus position*, most commonly either sentence-initial or -final (e.g. see Rebuschi & Tuller 1999; Drubig & Schaffar 2001; Neeleman et al. 2009; Féry & Ishihara 2016). Sentence-initially, often a specific construction such as a cleft is used (e.g. Lambrecht 2001; Hedberg 2013; Cesare 2014), where the focus in the cleft generally represents the highest prosodic prominence, while the post-focal main clause has reduced prominence (Lambrecht 2001; del Mar Vanrell & Fernández-Soriano 2018).

Word order type of the language and the syntactic focus position appear to covary. In verb-initial languages, an initial focus position seems to be common, and often coincides with the position of nuclear prominence (Herring 1990; Longacre 1995; Simard & Wegener 2017). For example, in Hungarian, narrowly focused items obligatorily appear immediately before the (finite) verb, i.e. initial apart from any preverbal topics (e.g. Kiss 2002; Szendroi 2003). The preverbal position is also the position of the nuclear accent in Hungarian, so the focus must be placed here to align with the nuclear prominence. Narrow focus in Hungarian is marked by increased prosodic prominence on the focused word and/or lowering of accent peaks and deaccenting in the post-focal region, and corrective (exclusive) focus is marked by increasing the relative prominence of the focus compared to the post-focal region (Genzel et al. 2015). Other verb-initial languages reported to have an initial focus position that coincides with the nuclear prominence include Māori (Bauer 1997), Samoan (Calhoun 2015) and probably other Polynesian languages (e.g. Clemens 2014), the Oceanic language Gela (Simard & Wegener 2017), the Berber language Tamasheq (Caron et al. 2015), and the Australian language Dalabon (Fletcher 2014); though see later in this section for counter cases.

Sentence-final focus is common for SVO languages, where the default nuclear prominence position is final, e.g. most Romance languages (Zubizarreta 1998; Ladd 2008; Frota & Prieto 2015a; Büring 2010). For example, in Madrid Spanish foci must be nuclear accented, and the nuclear accent must occur in phrase-final position. The prosodic marking of focus in Madrid Spanish is effectively the same as a standard stress-based system (see section 31.3.1), except that the tendency that the nuclear accent should appear in phrase-final position is weaker than

a tendency against non-canonical word order. Note that there is considerable variation within Romance languages, including between varieties of Spanish, in the extent to which they show *in situ* stress-based focus marking (Frota & Prieto 2015b; del Mar Vanrell & Fernández-Soriano 2018).

In verb-final languages, the focus position is often immediately before the verb, which correlates with nuclear prominence, with the verb consistently produced with lower pitch, e.g. Hindi (Patil et al. 2008; Féry et al. 2016), Bengali (Hayes & Lahiri 1991), Turkish (Vallduví & Engdahl 1996; Kamali 2011) and Basque (Elordieta & Hualde 2014).

There are a growing number of languages, however, where morphological and/or syntactic focus marking has not been found to correlate with any distinct prosodic marking. For instance, like other Mayan languages the tone language Yucatec Maya has a preverbal focus position, syntactically analysed as a cleft construction (Kügler et al. 2007: 189; Verhoeven & Skopeteas 2015: 3), and canonical word order is VOS. Kügler & Skopeteas (2006) show that the prosody of preverbal focused words does not differ from comparable non-focused words (cf. also Gussenhoven & Teeuw 2008). Moreover, Kügler & Skopeteas (2007) present quantitative evidence that *in situ* focus on adjectives in an object NP does not affect the tonal realisation either. Similar results as in Yucatec Maya are found for the intonation languages Wolof (Rialland & Robert 2001) and Nłeʔkepmxcin (Thompson River Salish) (Koch 2008), and for other African tone languages like Sotho (Zerbian 2007a; Zerbian et al. 2010), Hausa (Hartmann & Zimmermann 2007), Buli (Schwarz 2009), and further ones discussed in Downing & Rialland (2016b), and the Athabaskan languages Beaver (Schwiertz 2009) and Navajo (McDonough 2002) as well as in Malay and other varieties of Indonesian (e.g. Maskikit-Essed & Gussenhoven 2016), for which it is shown that neither stress nor prosodic focus is perceptually detected (Goedemans & van Zanten 2007; Roosman 2007).

The initial position is also associated with topics, with many languages placing topic constituents initially which may or may not be integrated syntactically with the rest of the clause (e.g. see Gundel & Fretheim 2004; Neeleman et al. 2009). A commonly found pattern is that initial topics form their own ι-phrase, and unlike foci, are not accompanied by any prominence reduction in post-topical material. Languages where this pattern is reported include Hungarian (Surányi et al. 2012; Genzel et al. 2015), German (Féry 2011), Māori (Bauer 1997), Gela (Simard & Wegener 2017), the West African language Zaar, Juba and Tripoli Arabic (Caron et al. 2015), Russian (Alter & Junghanns 2002) and the Australian language Jaminjung (Simard 2010).

31.5 Unified accounts

In this chapter, languages are grouped by the main type of prosodic cue each uses to encode IS. However, rather than being independent strategies, it is frequently proposed that these are different instantiations of a general principle of prosodic focus marking (e.g. Truckenbrodt 1995; Zubizarreta 1998; Gussenhoven 2008; Büring 2010; Féry 2013). All three types of cue have been argued to encompass the other two: *focus as prominence*, *focus as alignment* and *focus as register*.

The most commonly proposed unifying principle is *prominence*, i.e. the smallest prosodic unit (e.g. ω) containing the focus is the most prominent in the largest containing the focus (e.g. ι-phrase) (e.g. Truckenbrodt 1995, Samek-Lodovici 2005, Büring 2010). This is consistent with the pre-linguistic *effort code* (Gussenhoven 2002). Importantly, prominence is an abstract property, so cues may differ between languages. For phrase-based systems, it is argued prominence is at the phrasal level, which can be positional (Büring 2010). For example, as was shown in Korean, φ-phrases to the right of the focus are deleted (section 31.3.2), making

the focused φ-phrase right-most in the ι-phrase, and hence the most prominent (cf. analysis in Büring 2010). Consistent with this, the focused phrase is phonetically prominent. However, not all such languages show clear correlates of phonetic prominence of the focus, e.g. Chichewa (Downing & Pompino-Marschall 2013), weakening this claim. For register-based systems, pitch range expansion can be argued to mark ι-level prominence. Consistent with this, in Mandarin Chinese, lexical tones in focused words have more distinct f0 contours, and less coarticulatory effects (Chen et al. 2016). Syntactic and non-marking languages fit the principle where the syntactic focus position aligns with the default nuclear stress (see section 31.4). However, when there are no clear cues to nuclear stress, it is hard to see the theory-external evidence these fit the principle.

Féry (2013) proposes an alternative principle of *alignment* (see also Koch 2008). She claims cross-linguistically the strongest tendency is for focused constituents to be aligned with the left or right edge of a phrase, usually the ι-phrase, or sometimes the φ-phrase; with prominence being secondary, and separable from alignment. For stress-based systems, she argues nuclear stress is also phrasal, as it marks a φ-phrase head, therefore, e.g. in Germanic languages the nuclear accent is right-aligned as it is the right-most phrase head, cf. Figure 31.1, Büring (2010), and Truckenbrodt (1995). However, the phonetic cues to the assumed φ-phrase boundaries are often weak, e.g. after *Peter* in Figure 31.1a, weakening this claim. For syntactic and non-marking languages, similarly to the prominence-led approach, it is difficult to see the theory-external evidence for alignment where this does not involve phonetic cues to phrasing. Furthermore, it is not clear in this approach why alignment and prominence so often co-occur, if they are independent.

To our knowledge a fully-fledged *focus as register* theory has not been advocated for. However, in current approaches register reference lines are often assumed for languages with stress-based systems, implying a view of prominence encompassing stress and phrase-based systems (e.g. German Féry & Kügler 2008; Kügler & Féry 2017; Truckenbrodt 2002). Focal prominence raises the pitch register line across a phrase: affecting pitch accent height in a stress-based system, and the whole phrase in a phrase-based system. Féry & Ishihara (2010) further propose focus raises the register while givenness lowers it; however languages differ in the extent of raising/compression. For example, post-focal and givenness compression is almost complete in English and German (Kügler & Féry 2017), but only partial in Mandarin (Xu 1999) and Hindi (Patil et al. 2008), allowing tonal distinctions to be maintained in Mandarin.

These unifying principle accounts are appealing and explanatory over a wide range of languages, however, for all three there remain cases which fit awkwardly at best, especially for languages without any clear prosodic cues to focus. Rather, these would appear to be separate, though overlapping approaches. The details of where they overlap, and the extent to which they do, need much more empirical investigation.

31.6 Evaluation and considerations for future research

From the discussion of the different languages in this chapter, it emerges that certain prosodic characteristics of a language often entail certain types of prosodic encoding of IS. For instance, if a language has stress it most likely uses stress-based cues, or if a language uses predominantly phrase tones to mark intonation units it most likely uses phrase-based cues. However, this is not without exceptions. Further, as discussed in the previous section, future work in this area needs to provide more evidence to argue for a *prominence* view, a *phrasing* view or a *register* view of the expression of focus.

One important topic which we have not had space to cover in this chapter is methodology. Eliciting IS means to elicit both *mental states* of speakers and hearers and the *linguistic means* used to convey these mental states. It is not clear that classical tests, i.e. mini-dialogues such as question-answer pairs (cf. Krifka 2008; section 31.2) are sufficient to generate the appropriate mental states; more interactive tasks may be preferred (e.g. *Questionnaire of Information Structure* (QUIS), Skopeteas et al. 2006; Calhoun 2015; Genzel & Kügler 2010; Kügler et al. 2007; Kügler & Genzel 2014; Chen 2018). Elicitation materials need to be carefully constructed, and measured, to control for other effects such as tonal context and segmental influences (cf. Calhoun 2015; Genzel et al. 2015; Wang & Xu 2011; Kügler & Genzel 2012; Féry & Kügler 2008). Further, the majority of studies discussed rely on the acoustic analysis of production data. Only a few studies examine whether listeners perceive and process the prosodic cues according to their pragmatic IS manipulations (e.g. Baumann & Schumacher 2012; Dilley & Heffner 2013; Kügler submitted; Kügler & Gollrad 2015; Ladd & Morton 1997; Rump & Collier 1996; Zerbian 2007a). This is important, e.g. to determine if prominence or phrasing cues are primary.

References

Alter, Kai & Uwe Junghanns. 2002. Topic-Related Prosodic Patterns in Russian. *Current approaches to formal Slavic linguistics (= FDSL II (1997))* 9(9). 73.

Arnhold, Anja. 2014. Prosodic structure and focus realization in West Greenlandic. In Sun-Ah Jun (ed.), *Prosodic typology II*: *The phonology of intonation and phrasing*, 216–251. Oxford: Oxford University Press.

Arvaniti, Amalia & Evangelia Adamou. 2011. Focus expression in Romani. In Mary B. Washburn, Katherine McKinney-Bock, Erika Varis, Ann Sawyer & Barbara Tomaszewicz (eds.), *Proceedings of the 28th West Coast Conference on Formal Linguistics*, 240–248. Somerville, MA: Cascadilla Proceedings Project.

Ayers, Gayle M. 1996. *Nuclear accent types and prominence: Some psycholinguistic experiments.* United States - Ohio: The Ohio State University PhD Thesis.

Baltazani, Mary & Sun-Ah Jun. 1999. Focus and topic intonation in Greek. In John J. Ohala, Y. Hasegawa, Manjari Ohala, D. Granville & A. C. Bailey (eds.), *Proceedings of the 14th International Congress of Phonetic Sciences (ICPhS)*, 1305–1308. San Francisco: University of California.

Bauer, Winifred. 1997. *The Reed reference grammar of Māori / Winifred Bauer; with William Parker, Te Kareongawai Evans and Te Aroha Noti Teepa*. Auckland, N.Z.: Reed.

Baumann, Stefan. 2006. *The Intonation of Givenness. Evidence from German* (Linguistische Arbeiten 508). Tübingen: Niemeyer.

Baumann, Stefan. 2016. Second Occurrence Focus. In Caroline Féry & Shinichiro Ishihara (eds.), *Oxford Handbook of Information Structure*, 483–502. Oxford: Oxford University Press.

Baumann, Stefan, Martine Grice & Susanne Steindamm. 2006. Prosodic Marking of Focus Domains - Categorical or Gradient? In Rüdiger Hoffmann & Hansjörg Mixdorff (eds.), Proceedings of Speech Prosody 2006, Dresden, Germany, 301–304. Dresden: TUDpress.

Baumann, Stefan & Frank Kügler. 2015. Prosody and information status in typological perspective – Introduction to the Special Issue. *Lingua* 165(B). 179–182.

Baumann, Stefan & Arndt Riester. 2012. Referential and lexical givenness: Semantic, prosodic and cognitive aspects. In Gorka Elordieta & Pilar Prieto (eds.), *Prosody and Meaning* (Interface explorations 25), 119–162. Berlin: De Gruyter Mouton.

Baumann, Stefan & Petra B. Schumacher. 2012. (De-) Accentuation and the Processing of Information Status: Evidence from Event-Related Brain Potentials. *Language and Speech* 55(3). 361–381.

Beaver, David, Brady Z. Clark, Edward Flemming, T. F. Jaeger & Maria Wolters. 2007. When semantics meets phonetics: Acoustical studies of second-occurrence focus. *Language* 83(2). 245–276.

Beckman, Mary E. & Janet Pierrehumbert. 1986. Intonational structure in Japanese and English. *Phonology Yearbook* 3. 255–309.

Bishop, Jason. 2012. Information structural expectations in the perception of prosodic prominence. In Gorka Elordieta & Pilar Prieto (eds.), *Prosody and Meaning* (Interface explorations 25), 239–270. Berlin: De Gruyter Mouton.

Bishop, Jason. 2017. Focus projection and prenuclear accents: evidence from lexical processing. *Language, Cognition and Neuroscience* 32(2). 236–253.

Borràs-Comes, Joan, Maria del Mar Vanrell & Pilar Prieto. 2014. The role of pitch range in establishing intonational contrasts. *Journal of the International Phonetic Association* 44(1). 1–20.

Braun, Bettina. 2006. Phonetics and phonology of thematic contrast in German. *Language and Speech* 49(4). 451–493.

Brazil, David. 1985. *The Communicative Value of Intonation in English*. UK: University of Birmingham.

Breen, Mara, Evelina Fedorenko, Michael Wagner & Edward Gibson. 2010. Acoustic correlates of information structure. *Language and Cognitive Processes* 25(7-9). 1044–1098.
Bruce, Gösta. 1977. *Swedish Word Accents in Sentence Perspective* (Travaux de l'Institut de linguistique de Lund 12). Lund: Gleerup.
Burdin, Rachel S., Sara Phillips-Bourass, Rory Turnbull, Murat Yasavul, Cynthia G. Clopper & Judith Tonhauser. 2015. Variation in the prosody of focus in head- and head/edge-prominence languages. *Lingua* 165(B). 254–276.
Büring, Daniel. 2003. On D-Trees, Beans, and B-Accents. *Linguistics and Philosophy* 26(5). 511–545.
Büring, Daniel. 2010. Towards a typology of focus realization. In Malte Zimmermann & Caroline Féry (eds.), *Information structure*: *Theoretical, typological, and experimental perspectives*, 177–205. Oxford: Oxford University Press.
Büring, Daniel. 2016. *Intonation and Meaning*. Oxford: Oxford University Press.
Calhoun, Sasha. 2009. What Makes a Word Contrastive? Prosodic, Semantic and Pragmatic Perspectives. In Dagmar Barth-Weingarten, Nicole Dehé & Anne Wichmann (eds.), *Where prosody meets pragmatics* (Studies in pragmatics 8), 53–78. Bingley: Emerald.
Calhoun, Sasha. 2010. The centrality of metrical structure in signaling information structure: A probabilistic perspective. *Language* 86(1). 1–42.
Calhoun, Sasha. 2012. The theme/rheme distinction: Accent type or relative prominence? *Journal of Phonetics* 40(2). 329–349.
Calhoun, Sasha. 2015. The Interaction of Prosody and Syntax in Samoan Focus Marking. *Lingua* 165(B). 205–229.
Carlson, Katy, M.W Dickey, Lyn Frazier & Charles Clifton, JR. 2009. Information structure expectations in sentence comprehension. *The Quarterly Journal of Experimental Psychology* 62(1). 114–139.
Caron, Bernard, Cécile Lux, Stefano Manfredi & Christophe Pereira. 2015. The Intonation of Topic and Focus: Zaar (Nigeria), Tamasheq (Niger), Juba Arabic (South Sudan) and Tripoli Arabic (Libya). In Amina Mettouchi, Martine Vanhove & Dominique Caubet (eds.), *Corpus-based studies of lesser-described languages: The CorpAfRoAs corpus of spoken Afro-Asiatic languages* (Studies in Corpus Linguistics 68), 63–115: John Benjamins Publishing Company.
Cesare, Anna-Maria D. 2014. *Frequency, Forms and Functions of Cleft Constructions in Romance and Germanic: Contrastive, Corpus-Based Studies*. Berlin: Walter de Gruyter.
Chafe, Wallace L. 1976. Givenness, Contrastiveness, Definiteness, Subjects and Topics. In Charles N. Li (ed.), *Subject and Topic*, 27–55. New York: Academic Press.
Chahal, Dana & Sam Hellmuth. 2014. The intonation of Lebanese and Egyptian Arabic. In Sun-Ah Jun (ed.), *Prosodic typology II*: *The phonology of intonation and phrasing*, 365–404. Oxford: Oxford University Press.
Chen, Aoju (2018). Get the focus right across languages: Acquisition of prosodic focus-marking in production. In P. Prieto & Esteve-Gibert, N. (eds) *Prosodic development in first language acquisition*, 295–314). Amsterdam: John Benjamins.
Chen, Yiya. 2006. Durational adjustment under corrective focus in Standard Chinese. *Journal of Phonetics* 34(2). 176–201.
Chen, Yiya & Bettina Braun. 2006. Prosodic Realization of Information Structure Categories in Standard Chinese. In Rüdiger Hoffmann & Hansjörg Mixdorff (eds.), *Proceedings of Speech Prosody 2006, Dresden, Germany*, paper 051. Dresden: TUDpress.
Chen, Yiya, Peppina P.-l. Lee & Haihua Pan. 2016. Topic and Focus Marking in Chinese. In Caroline Féry & Shinichiro Ishihara (eds.), *Oxford Handbook of Information Structure*, 733–752. Oxford: Oxford University Press.
Clemens, Lauren E. 2014. *Prosodic noun incorporation and verb-initial syntax.* USA: Harvard University PhD Thesis.

585 Clements, George N. 1979. The description of terraced-level tone languages. *Language* 55(3).
586 536–558.
587 Clopper, Cynthia G. & Judith Tonhauser. 2013. The Prosody of Focus in Paraguayan Guaraní.
588 *International Journal of American Linguistics* 79(2). 219–251.
589 Cole, Jennifer. 2015. Prosody in context: A review. *Language, Cognition and Neuroscience*
590 30(1-2). 1–31.
591 Cole, Jennifer, Yoonsook Mo & Mark Hasegawa-Johnson. 2010. Signal-based and
592 expectation-based factors in the perception of prosodic prominence. *Laboratory phonology*
593 1(2).
594 Cutler, Anne, Delphine Dahan & Wilma van Donselaar. 1997. Prosody in the comprehension
595 of Spoken Language: A literature review. *Language and Speech* 40(2). 141–201.
596 del Mar Vanrell, Maria, Francesc Ballone, Carlo Schirru & Pilar Prieto. 2015. Sardinian
597 intonational phonology: Logudorese and Campidanese varieties. In Sónia Frota & Pilar
598 Prieto (eds.), *Intonation in Romance*, 317–349. Oxford: Oxford University Press.
599 del Mar Vanrell, Maria & Olga Fernández-Soriano. 2018. Language variation at the prosody-
600 syntax interface: Focus in European Spanish. In Marco García & Melanie Uth (eds.), *Focus*
601 *Realization in Romance and Beyond* , 33-70. Amsterdam: John Benjamins.
602 del Mar Vanrell, Maria, Antonio Stella, Barbara Gili Fivela & Pilar Prieto. 2013. Prosodic
603 manifestations of the Effort Code in Catalan, Italian and Spanish contrastive focus. *Journal*
604 *of the International Phonetic Association* 43(2). 195–220.
605 Dilley, Laura C. 2005. *The phonetics and phonology of tonal systems.* Cambridge,
606 Massachusetts: MIT PhD Thesis.
607 Dilley, Laura C. & Christopher C. Heffner. 2013. The role of f0 alignment in distinguishing
608 intonation categories: evidence from American English. *Journal of Speech Sciences* 3(1).
609 3–67.
610 Downing, Laura J., Al Mtenje & Bernd Pompino-Marschall. 2004. Prosody and Information
611 Structure in Chichewa. In Susanne Fuchs & Silke Hamann (eds.), *Papers in phonetics and*
612 *phonology* (ZASpil), 167–186. Berlin.
613 Downing, Laura J. & Bernd Pompino-Marschall. 2013. The focus prosody of Chichewa and
614 the Stress-Focus constraint: a response to Samek-Lodovici (2005). *Natural Language &*
615 *Linguistic Theory* 31(3). 647–681.
616 Downing, Laura J. & Annie Rialland (eds.). 2016a. *Intonation in African Tone Languages*.
617 Berlin: De Gruyter.
618 Downing, Laura J. & Annie Rialland. 2016b. Introduction. In Laura J. Downing & Annie
619 Rialland (eds.), *Intonation in African Tone Languages*, 1–16. Berlin: De Gruyter.
620 Drubig, Hans B. & W. Schaffar. 2001. Focus constructions. In Martin Haspelmath, Ekkehard
621 König, Wulf Oesterreicher & Wolfgang Raible (eds.), *Language typology and language*
622 *universals*: *An international handbook*, 1079–1104. Berlin: Walter de Gruyter.
623 Eady, Stephen J., William E. Cooper, Gayle V. Klouda, Pamela R. Mueller & Dan W. Lotts.
624 1986. Acoustical Characteristics of Sentential Focus: Narrow vs. Broad and Single vs. Dual
625 Focus Environments. *Language and Speech* 29(3). 233–251.
626 El Zarka, Dina. 2017. Arabic Intonation. In *Oxford Handbooks online*, 1–37. Oxford: Oxford
627 University Press.
628 Elordieta, Gorka & Jose I. Hualde. 2014. Intonation in Basque. In Sun-Ah Jun (ed.), *Prosodic*
629 *typology II*: *The phonology of intonation and phrasing*, 405–463. Oxford: Oxford
630 University Press.
631 Fanselow, Gisbert. 2016. Syntactic and Prosodic Reflexes of Information Structure in
632 Germanic. In Caroline Féry & Shinichiro Ishihara (eds.), *Oxford Handbook of Information*
633 *Structure*, 621–641. Oxford: Oxford University Press.
634 Féry, Caroline. 1993. *German Intonational Patterns* (Linguistische Arbeiten 285). Tübingen:
635 Niemeyer.

Féry, Caroline. 2001. Focus and Phrasing in French. In Caroline Féry & Wolfgang Sternefeld (eds.), *Audiatur vox sapientiae*: *A Festschrift for Arnim von Stechow* (Studia grammatica 52), 153–181. Berlin: Akademie Verlag.
Féry, Caroline. 2007. The Prosody of Topicalization. In Kerstin Schwabe & Susanne Winkler (eds.), *On Information Structure, Meaning and Form*, 69–86. Amsterdam: J. Benjamins.
Féry, Caroline. 2008. Information structural notions and the fallacy of invariant grammatical correlates. *Acta Linguistica Hungarica* 55(3-4). 361–380.
Féry, Caroline. 2011. German sentence accents and embedded prosodic phrases. *Lingua* 121(13). 1906–1922.
Féry, Caroline. 2013. Focus as prosodic alignment. *Natural Language & Linguistic Theory* 31(3). 683–734.
Féry, Caroline & Shinichiro Ishihara. 2010. How focus and givenness shape prosody. In Malte Zimmermann & Caroline Féry (eds.), *Information structure*: *Theoretical, typological, and experimental perspectives*, 36–65. Oxford: Oxford University Press.
Féry, Caroline & Shinichiro Ishihara (eds.). 2016. *Oxford Handbook of Information Structure*. Oxford: Oxford University Press.
Féry, Caroline, Gerrit Kentner & Pramod Pandey. 2016. The prosody of Focus and Givenness in Hindi and Indian English. *Studies in Language;* 40(2). 302–339.
Féry, Caroline & Frank Kügler. 2008. Pitch accent scaling on given, new and focused constituents in German. *Journal of Phonetics* 36(4). 680–703.
Féry, Caroline & Vieri Samek-Lodovici. 2006. Focus Projection and Prosodic Prominence in Nested Foci. *Language* 82(1). 131–150.
Fletcher, Janet. 2010. The Prosody of Speech: Timing and Rhythm. In William J. Hardcastle, John Laver & Fiona E. Gibbon (eds.), *The Handbook of Phonetic Sciences*: *Second Edition*, 523–602. Oxford: Wiley-Blackwell.
Fletcher, Janet. 2014. Intonation and prosody in Dalabon. In Sun-Ah Jun (ed.), *Prosodic typology II*: *The phonology of intonation and phrasing*, 252–272. Oxford: Oxford University Press.
Frota, Sónia & Pilar Prieto (eds.). 2015a. *Intonation in Romance*. Oxford: Oxford University Press.
Frota, Sónia & Pilar Prieto. 2015b. Intonation in Romance. In Sónia Frota & Pilar Prieto (eds.), *Intonation in Romance*, 392–418. Oxford: Oxford University Press.
Genzel, Susanne, Shinichiro Ishihara & Balázs Surányi. 2015. The prosodic expression of focus, contrast and givenness: A production study of Hungarian. *Lingua* 165(B). 183–204.
Genzel, Susanne & Frank Kügler. 2010. How to elicit semi-spontaneous focus realizations with specific tonal patterns. In Mira Grubic, Susanne Genzel & Frank Kügler (eds.), *Linguistic Fieldnotes I*: *Information Structure in different African Languages* (Interdisciplinary Studies on Information Structure (ISIS) 13), 77–102. Potsdam: Universitätsverlag Potsdam.
Godjevac, Svetlana. 2005. Transcribing Serbo-Croatian Intonation. In Sun-Ah Jun (ed.), *Prosodic Typology*: *The Phonology of Intonation and Phrasing*, 146–171. Oxford: Oxford University Press.
Goedemans, Rob & van Zanten, Ellen. 2007. Stress and accent in Indonesian. In Vincent van Heuven & Ellen van Zanten (eds.), *Prosody in Indonesian languages*, 35–62. Utrecht: LOT.
Grice, Martine, Stefan Baumann & Ralf Benzmüller. 2005. German Intonation in Autosegmental-Metrical Phonology. In Sun-Ah Jun (ed.), *Prosodic Typology*: *The Phonology of Intonation and Phrasing*, 55–83. Oxford: Oxford University Press.
Gundel, Jeanette K. & Thorstein Fretheim. 2004. Topic and Focus. In Laurence R. Horn & Gregory Ward (eds.), *The Handbook of Pragmatics*, 175–196. Oxford, UK: Blackwell.
Gussenhoven, Carlos. 1983. Testing the Reality of Focus Domains. *Language and Speech* 26(1). 61–80.

687 Gussenhoven, Carlos. 2002. Intonation and interpretation: Phonetics and Phonology. In
688 Bernard Bel & Isabelle Marlien (eds.), *Proceedings of the Speech Prosody 2002*
689 *Conference*, 47–57. Aix-en-Provence: Laboratoire Parole et Langage.
690 Gussenhoven, Carlos. 2004. *The Phonology of Tone and Intonation*. Cambridge: Cambridge
691 University Press.
692 Gussenhoven, Carlos. 2008. Notions and subnotions in information structure. *Acta Linguistica*
693 *Hungarica* 55(3). 381–395.
694 Gussenhoven, Carlos & R. Teeuw. 2008. A moraic and a syllabic H-tone in Yucatec Maya. In
695 Esther Herrera & Pedro M. Butrageño (eds.), *Fonología instrumental*: *Patrones fónicos y*
696 *variación*, 49–71. Mexico City: El Colegio de México.
697 Hartmann, Katharina & Malte Zimmermann. 2007. In Place - Out of Place? Focus Strategies
698 in Hausa. In Kerstin Schwabe & Susanne Winkler (eds.), *On Information Structure,*
699 *Meaning and Form*, 365–403. Amsterdam: J. Benjamins.
700 Hayes, Bruce & Aditi Lahiri. 1991. Bengali intonational phonology. *Natural Language and*
701 *Linguistic Theory* 9(1). 47–96.
702 Hedberg, Nancy. 2013. Multiple focus and cleft sentences. In Katharina Hartmann & Tonjes
703 Veenstra (eds.), *Cleft structures* (Linguistik aktuell), 227–250: John Benjamins.
704 Hellmuth, Sam. 2011. Acoustic cues to focus and givenness in Egyptian Arabic. In Zeki M.
705 Hassan & Barry Heselwood (eds.), *Instrumental Studies in Arabic Phonetics* (Current
706 Issues in Linguistic Theory), 299–324. Amsterdam: John Benjamins Publishing Company.
707 Herring, Susan. 1990. Information structure as a consequence of word order type. In
708 *Proceedings of the 16th annual meeting of the Berkeley Linguistics Society*, 163–174. UC
709 Berkeley.
710 Hirschberg, Julia, Agustín Gravano, Ani Nenkova, Elisa Sneed & Gregory Ward. 2007.
711 Intonational overload: Uses of the Downstepped (H* !H* L- L%) contour in read and
712 spontaneous speech. In Jennifer Cole & José I. Hualde (eds.), *Laboratory phonology 9*
713 (Phonology and phonetics 4-3), 455–482. Berlin: De Gruyter Mouton.
714 Hosseini, Ayat. 2014. *The Phonology and Phonetics of Prosodic Prominence in Persian.*
715 Japan: University of Tokyo PhD Thesis.
716 Ito, Kiwako & Shari R. Speer. 2008. Anticipatory effects of intonation: Eye movements
717 during instructed visual search. *Journal of Memory and Language* 58(2). 541–573.
718 Jasinskaja, Ekaterina. 2016. Information Structure in Slavik. In Caroline Féry & Shinichiro
719 Ishihara (eds.), *Oxford Handbook of Information Structure*, 709–732. Oxford: Oxford
720 University Press.
721 Jeon, Hae-Sung & Francis Nolan. 2017. Prosodic Marking of Narrow Focus in Seoul Korean.
722 *Laboratory phonology* 8(1). 390.
723 Jepson, Kathleen. 2014. Intonational marking of focus in Torau. In Lauren Gawne & Jill
724 Vaughan (eds.), *Selected Papers from the 44th Conference of the Australian Linguistic*
725 *Society*, 261–282. Melbourne.
726 Jokweni, Mbulelo W. 1995. *Aspects of Isixhosa Phrasal Phonology.* Urbana, Illinois:
727 University of Illinois at Urbana-Champaign PhD Thesis.
728 Jun, Sun-Ah. 1998. The accentual phrase in the Korean prosodic hierarchy. *Phonology* 15(2).
729 189–226.
730 Jun, Sun-Ah. 2005a. Korean Intonational Phonology and Prosodic Transcription. In Sun-Ah
731 Jun (ed.), *Prosodic Typology*: *The Phonology of Intonation and Phrasing*, 201–229.
732 Oxford: Oxford University Press.
733 Jun, Sun-Ah (ed.). 2005b. *Prosodic Typology*: *The Phonology of Intonation and Phrasing*.
734 Oxford: Oxford University Press.
735 Jun, Sun-Ah (ed.). 2014. *Prosodic typology II*: *The phonology of intonation and phrasing*.
736 Oxford: Oxford University Press.

Jun, Sun-Ah & Cécile Fougeron. 1995. The accentual phrase and the prosodic structure of French. In Kjell Elenius & Peter Branderud (eds.), *Proceedings of the 13th International Congress of Phonetic Sciences*, 722–725. Stockholm.
Jun, Sun-Ah & Cécile Fougeron. 2000. A phonological model of French intonation. In Antonis Botinis (ed.), *Intonation*: *Analysis, Modelling and Technology*, 209–242. Dordrecht: Kluwer.
Jun, Sun-Ah & H.S Kim. 2007. VP Focus and narrow focus in Korean. In Jürgen Trouvain & William J. Barry (eds.), *Proceedings of the 16th International Congress of Phonetic Sciences*, 1277–1280. Saarbrücken, Germany, 4-10 August 2007.
Jun, Sun-Ah & Hyuck-Joon Lee. 1998. Phonetic and Phonological Markers of Contrastive Focus in Korean. In *Proceedings of fifth International Conference on Spoken Language Processing. ICSLP-98*, 1295–1298. Sydney.
Kamali, Beste. 2011. *Topics at the PF Interface of Turkish.* Massachusetts: Harvard University Dissertation.
Kanerva, Jonni M. 1990. Focusing on phonological phrases in Chichewa. In Sharon Inkelas & Draga Zec (eds.), *The Phonology-Syntax Connection*, 145–161. Chicago: University Of Chicago Press.
Katz, Jonah & Elisabeth O. Selkirk. 2011. Contrastive focus vs. discourse-new: Evidence from phonetic prominence in English. *Language* 87(4). 771–816.
Kiss, Katalin É. 2002. *The syntax of Hungarian*. Cambridge: Cambridge University Press.
Koch, Karsten. 2008. *Intonation and Focus in Nle?kepmxcin (Thompson River Salish).* Vancouver, Canada: University of British Columbia.
Kochanski, Greg, Esther Grabe, John Coleman & Burton S. Rosner. 2005. Loudness predicts prominence: Fundamental frequency lends little. *The Journal of the Acoustical Society of America* 118(2). 1038–1054.
Krahmer, E. & Marc Swerts. 2001. On the alleged existence of contrastive accents. *Speech Communication* 34(4). 391–405.
Krifka, Manfred. 2008. Basic notions of information structure. *Acta Linguistica Hungarica* 55(3). 243–276.
Kügler, Frank. 2011. *The prosodic expression of focus in typologically unrelated languages.* Postdam: Universität Potsdam, Humanwissenschaftliche Fakultät Habilitationsschrift.
Kügler, Frank. Submitted. Post-focal compression as a prosodic cue for focus perception in Hindi. *Journal of South Asian Linguistics*.
Kügler, Frank & Caroline Féry. 2017. Postfocal downstep in German. *Language and Speech* 60(2). 260–288.
Kügler, Frank & Susanne Genzel. 2012. On the Prosodic Expression of Pragmatic Prominence: The Case of Pitch Register Lowering in Akan. *Language and Speech* 55(3). 331–359.
Kügler, Frank & Susanne Genzel. 2014. On the elicitation of focus – prosodic differences as a function of sentence mode of the context? In Carlos Gussenhoven, Yiya Chen & Dan Dediu (eds.), *TAL-2014*: *The 4th International Symposium on Tonal Aspects of Languages, Nijmegen, The Netherlands, May 13-16, 2014*, 71–74. ISCA Archive.
Kügler, Frank & Anja Gollrad. 2015. Production and Perception of Contrast: The case of the rise-fall contour in German. *Frontiers in psychology* 6(1254). 1–18.
Kügler, Frank & Stavros Skopeteas. 2006. Interaction of Lexical Tone and Information Structure in Yucatec Maya. In *Proceedings of the Second International Symposium on Tonal Aspects of Languages*, 77–82. La Rochelle.
Kügler, Frank & Stavros Skopeteas. 2007. On the universality of prosodic reflexes of contrast: The case of Yucatec Maya. In Jürgen Trouvain & William J. Barry (eds.), *Proceedings of the 16th International Congress of Phonetic Sciences*, 1025–1028. Saarbrücken, Germany, 4-10 August 2007.

Kügler, Frank, Stavros Skopeteas & Elisabeth Verhoeven. 2007. Encoding Information Structure in Yucatec Maya: On the Interplay of Prosody and Syntax. In Shinichiro Ishihara, Stefanie Jannedy & Anne Schwarz (eds.), *Interdisciplinary Studies on Information Structure 8* (Working Papers of the SFB 632), 187–208.
Ladd, D. R. 2008. *Intonational Phonology*, 2nd edn. Cambridge: Cambridge University Press.
Ladd, D. R. & R. Morton. 1997. The perception of intonational emphasis: continuous or categorical? *Journal of Phonetics* 25(3). 313–342.
Ladd, D. R. & Astrid Schepman. 2003. 'Sagging transitions' between high pitch accents in English: experimental evidence. *Journal of Phonetics* 31(1). 81–112.
Lambrecht, Knud. 2001. A framework for the analysis of cleft constructions. *Linguistics* 39(3). 463.
Longacre, Robert E. 1995. Left shifts in strongly VSO languages. In Pamela A. Downing & Michael Noonan (eds.), *Typological Studies in Language*, 331–354. Amsterdam: John Benjamins Publishing Company.
Luchkina, Tatiana & Jennifer S. Cole. 2016. Structural and Referent-Based Effects on Prosodic Expression in Russian. *Phonetica* 73(3-4). 279–313.
Manolescu, Alis, Daniel Olson & Marta Ortega-Llebaria. 2009. Cues to contrastive focus in Romanian. In Marina C. Vigário, Sónia Frota & Maria J. Freitas (eds.), *Phonetics and phonology*: *Interactions and interrelations* (Amsterdam studies in the theory and history of linguistic science. Series IV, Current issues in linguistic theory v. 306), 71–90. Amsterdam: John Benjamins.
Maskikit-Essed, R., & Carlos Gussenhoven. 2016. No stress, no pitch accent, no prosodic focus: The case of Ambonese Malay. *Phonology* 33(2). 353–389.
McDonough, Joyce. 2002. The Prosody of Interrogative and Focus Constructions in Navajo. In Andrew Carnie, Heidi Harley & MaryAnn Willie (eds.), *Formal Approaches to Functional Phenomena. In honor of Eloise Jelinek*, 191–206. Amsterdam/Philadelphia: John Benjamins.
Myrberg, Sara & Tomas Riad. 2016. On the Expression of Focus in the Metrical Grid and in the Prosodic Hierarchy. In Caroline Féry & Shinichiro Ishihara (eds.), *Oxford Handbook of Information Structure*, 441–462. Oxford: Oxford University Press.
Neeleman, Ad, Elena Titov, Hans van de Koot & Reiko Vermeulen. 2009. A syntactic typology of topic focus and contrast. In Jeroen van Craenenbroeck (ed.), *Alternatives to Cartography* (Studies in generative grammar), 15–52. Berlin: De Gruyter Mouton.
Ots, Nele. 2017. On the phrase-level function of f0 in Estonian. *Journal of Phonetics* 65. 77–93.
Patil, Umesh, Gerrit Kentner, Anja Gollrad, Frank Kügler, Caroline Féry & Shravan Vasishth. 2008. Focus, word order and intonation in Hindi. *Journal of South Asian Linguistics* 1(1). 53–67.
Patin, Cédric. 2016. Tone and intonation in Shingazidja. In Laura J. Downing & Annie Rialland (eds.), *Intonation in African Tone Languages*, 285–321. Berlin: De Gruyter.
Peng, Shu-hui, Chan, Marjorie K. M., Chiu-yu Tseng, Tsan Huang, Ok J. Lee & Mary E. Beckman. 2005. Towards a Pan-Mandarin System for Prosodic Transcription. In Sun-Ah Jun (ed.), *Prosodic Typology*: *The Phonology of Intonation and Phrasing*, 230–270. Oxford: Oxford University Press.
Pierrehumbert, Janet B. & Julia Hirschberg. 1990. The Meaning of Intonational Contours in the Interpretation of Discourse. In Philip R. Cohen, Jerry Morgan & Martha E. Pollack (eds.), *Intentions in Communication*, 271–311. Cambridge: MIT Press.
Prieto, Pilar. 2015. Intonational meaning. *Wiley Interdisciplinary Reviews: Cognitive Science* 6(4). 371–381.
Rebuschi, Georges & Laurice Tuller (eds.). 1999. *The grammar of focus* (Linguistik aktuell v. 24). Amsterdam: John Benjamins.

Repp, Sophie. 2016. Contrast: Dissecting an Elusive Information-structural Notion and its Role in Grammar. In Caroline Féry & Shinichiro Ishihara (eds.), *Oxford Handbook of Information Structure*, 270–289. Oxford: Oxford University Press.
Repp, Sophie & Heiner Drenhaus. 2015. Intonation influences processing and recall of left-dislocation sentences by indicating topic vs. focus status of dislocated referent. *Language, Cognition and Neuroscience* 30(3). 324–346.
Rialland, Annie & Stéphane Robert. 2001. The intonational system of Wolof. *Linguistics* 39(5). 893–939.
Riester, Arndt & Jörn Piontek. 2015. Anarchy in the NP. When New Nouns Get Deaccented and Given Nouns Don't. *Lingua* 165(B). 230–253.
Roosman, Lilie. 2007. Melodic structure in Toba Batak and Betawi Malay word prosody. In Vincent van Heuven & Ellen van Zanten (eds.), Prosody in Indonesian languages, 89–115. Utrecht: LOT.
Rump, H. H. & René Collier. 1996. Focus Conditions and the Prominence of Pitch-Accented Syllables. *Language & Speech* 39(1). 1–17.
Sadat-Tehrani, Nima. 2007. *The intonational grammar of Persian.* Canada: University of Manitoba PhD Thesis.
Samek-Lodovici, Vieri. 2005. Prosody-syntax interaction in the expression of focus. *Natural Language and Linguistic Theory* 23(3). 687–755.
Schwarz, Anne. 2009. Tonal focus reflections in Buli and some Gur relatives. *Lingua* 119(6). 950–972.
Schwiertz, Gabriele. 2009. *Intonation & Prosodic Structure in Beaver (Athabaskan)-Explorations on the language of the Danezaa.* Köln: Universität zu Köln. PhD Thesis.
Selkirk, Elisabeth O. 1995. Sentence prosody: Intonation, stress, and phrasing. In John A. Goldsmith (ed.), *The Handbook of Phonological Theory*, 550–569. Cambridge, MA: Blackwell.
Simard, Candide. 2010. *The Prosodic Contours of Jaminjung, a Language of Northern Australia.* Manchester, UK: University of Manchester PhD Thesis.
Simard, Candide & Claudia Wegener. 2017. Fronted NPs in a verb-initial language – clause-internal or external? Prosodic cues to the rescue! *Glossa: a journal of general linguistics* 2(1).
Skopeteas, Stavros. 2016. Information Structure in Modern Greek. In Caroline Féry & Shinichiro Ishihara (eds.), *Oxford Handbook of Information Structure*, 686–708. Oxford: Oxford University Press.
Skopeteas, Stavros & Gisbert Fanselow. 2010. Focus types and argument asymmetries: A cross-linguistic study in language production. In Carsten Breul & Edward Göbbel (eds.), *Comparative and contrastive studies of information structure* (Linguistics today 165), 165–197. Amsterdam: John Benjamins.
Skopeteas, Stavros; Ines Fiedler, Sam Hellmuth, Anne Schwarz, Ruben Stoel, Gisbert Fanselow, Caroline Féry & Manfred Krifka. 2006. *Questionnaire on Information Structure (QUIS)* (Interdisciplinary Studies on Information Structure (ISIS) 4). Potsdam: Universitätsverlag Potsdam.
Skopeteas, Stavros & Caroline Féry. submitted. Focus and intonation in Georgian: constituent structure and prosodic realization.
Steedman, Mark. 2000. Information Structure and the Syntax-Phonology Interface. *Linguistic Inquiry* 31(4). 649–689.
Steedman, Mark. 2014. The surface-compositional semantics of English intonation. *Language* 90(1). 2–57.
Surányi, Balázs, Shinichiro Ishihara & Fabian Schubö. 2012. Syntax-prosody mapping, topic-comment structure and stress-focus correspondence in Hungarian. In Gorka Elordieta &

Pilar Prieto (eds.), *Prosody and Meaning* (Interface explorations 25), 35–72. Berlin: De Gruyter Mouton.
Swerts, Marc, E. Krahmer & C. Avesani. 2002. Prosodic marking of information status in Dutch and Italian: A comparative analysis. *Journal of Phonetics* 30(4). 629–654.
Szendroi, Kriszta. 2003. A stress-based approach to the syntax of Hungarian focus. *Linguistic review* 20(1). 37–78.
Terken, Jacques & Dik J. Hermes. 2000. The perception of prosodic prominence. In Merle Horne (ed.), *Prosody: Theory and Experiment*: *Studies presented to Gösta Bruce*, 89–128. Dordrecht: Kluwer.
Truckenbrodt, Hubert. 1995. *Phonological phrases-their relation to syntax, focus, and prominence.* Cambridge, Massachusetts: MIT PhD Thesis.
Truckenbrodt, Hubert. 2002. Upstep and embedded register levels. *Phonology* 19(1). 77–120.
Turk, A. E. & J. R. Sawusch. 1996. The processing of duration and intensity cues to prominence. *The Journal of the Acoustical Society of America* 99(6). 3782–3790.
Turk, Alice. 2011. The Temporal Implementation of Prosodic Structure. In Abigail C. Cohn, Cécile Fougeron & Marie Huffman (eds.), *The Oxford Handbook of Laboratory Phonology*, 242–253. UK: Oxford University Press.
Vallduví, Enric & Elisabeth Engdahl. 1996. The linguistic realization of information packaging. *Linguistics* 34(3). 459–520.
Venditti, Jennifer J., Kikuo Maekawa & Mary E. Beckman. 2008. Prominence Marking in the Japanese Intonation System. In Shigeru Miyagawa (ed.), *The Oxford Handbook of Japanese Linguistics*, 456–512. Oxford: Oxford University Press.
Verhoeven, Elisabeth & Stavros Skopeteas. 2015. Licensing Focus Constructions in Yucatec Maya. *International Journal of American Linguistics* 81(1). 1–40.
Wagner, Michael. 2005. *Prosody and Recursion.* Cambridge, Massachusetts: MIT PhD Thesis.
Wang, Bei & Yi Xu. 2011. Differential prosodic encoding of topic and focus in sentence-initial position in Mandarin Chinese. *Journal of Phonetics* 37. 502–520.
Watson, Duane G., Michael K. Tanenhaus & Christine A. Gunlogson. 2008. Interpreting Pitch Accents in Online Comprehension: H* vs. L+H*. *Cognitive Science* 32(7). 1232–1244.
Welby, Pauline. 2003. Effects of pitch accent position, type, and status on focus projection. *Language and Speech* 46(1). 53-81.
Xu, Yi. 1999. Effects of tone and focus on the formation and alignment of f0 contours. *Journal of Phonetics* 27(1). 55–105.
Xu, Yi. 2011. Post-focus compression: Cross-linguistic distribution and historical origin. In Eric Zee & Wai-Sum Lee (eds.), *Proceedings of the 17th International Congress of Phonetic Sciences (ICPhS XVII), Hong Kong*, 152–155.
Xu, Yi & Ching X. Xu. 2005. Phonetic realization of focus in English declarative intonation. *Journal of Phonetics* 33(2). 159–197.
Xu, Yi, Szu-Wie Chen & Bei Wang. 2012. Prosodic focus with and without post-focus compression: A typological divide within the same language family? *The Linguistic Review* 29. 131–147.
Yang, Anqi. 2018. The acquisition of prosodic focus-marking in Mandarin Chinese- and Seoul Korean-speaking children. PhD Thesis. Utrecht: LOT.
Zerbian, Sabine. 2004. Phonological Phrases in Xhosa (Southern Bantu). In Susanne Fuchs & Silke Hamann (eds.), *Papers in phonetics and phonology* (ZASpil), 71–99. Berlin.
Zerbian, Sabine. 2007a. Phonological phrasing in Northern Sotho (Bantu). *The Linguistic Review* 24. 233–262.
Zerbian, Sabine. 2007b. The subject/object asymmetry in Northern Sotho. In Kerstin Schwabe & Susanne Winkler (eds.), *On Information Structure, Meaning and Form*, 323–346. Amsterdam: J. Benjamins.

940 Zerbian, Sabine, Susanne Genzel & Frank Kügler. 2010. Experimental work on prosodically-
941 marked information structure in selected African languages (Afroasiatic and Niger-Congo).
942 In *Workshop on Experimental Approaches to Focus, Chicago, Speech Prosody 2010*, 1–4.
943 Chicago.
944 Zimmermann, Malte & Caroline Féry. 2010. Introduction. In Malte Zimmermann & Caroline
945 Féry (eds.), *Information structure*: *Theoretical, typological, and experimental perspectives*,
946 1–11. Oxford: Oxford University Press.
947 Zubizarreta, Maria L. 1998. *Prosody, focus, and word order* (Linguistic inquiry monographs
948 33). Cambridge, MA: MIT Press.

(a)

((L+H*) φ L- ( )φ)ι L%

[PEter]F stolethe cookie

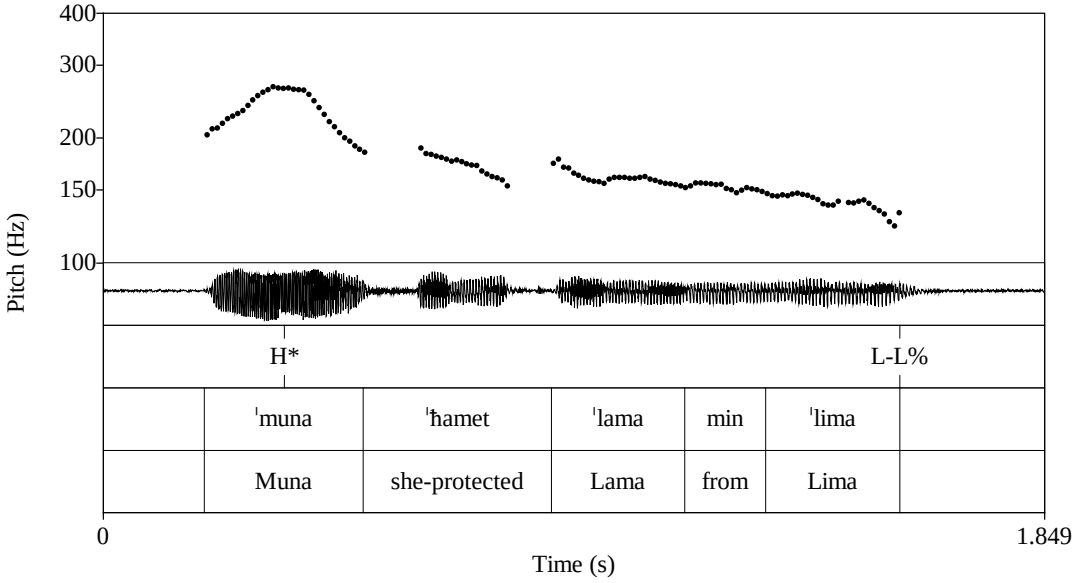
(b)

(H*)φ (L+H*)φ)ι L-L%

PEter stole the [COOKie]F

Figure 31.1: Typical realisations of (1) and (4), showing how focus position affects prosodic realisation. A schematic pitch realization is given, along with the prosodic phrasing, intonational tune, and text, where capitals indicate the pitch accented syllable. See text for further details.

(a)



(b)

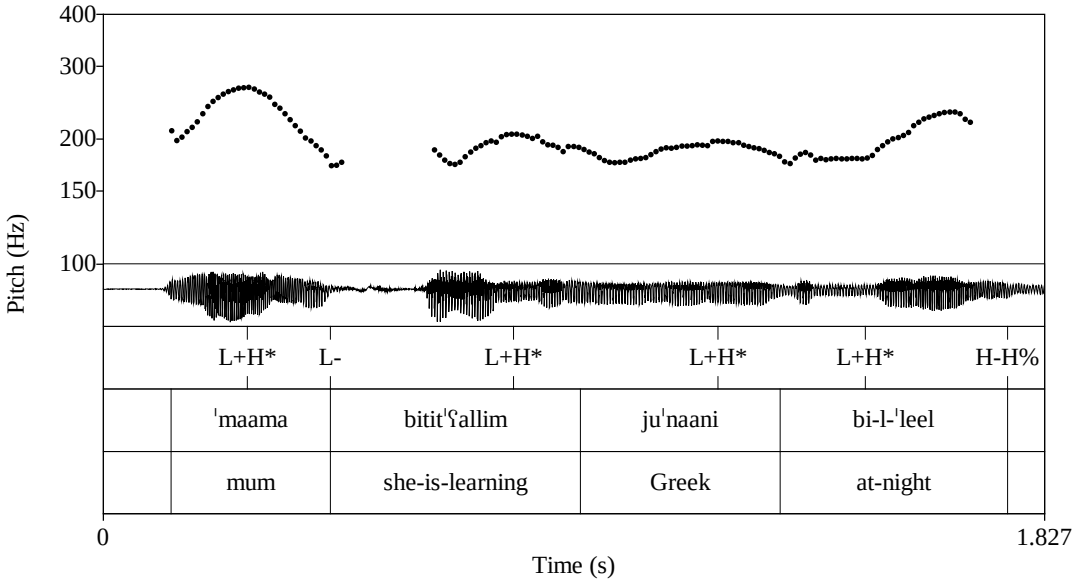
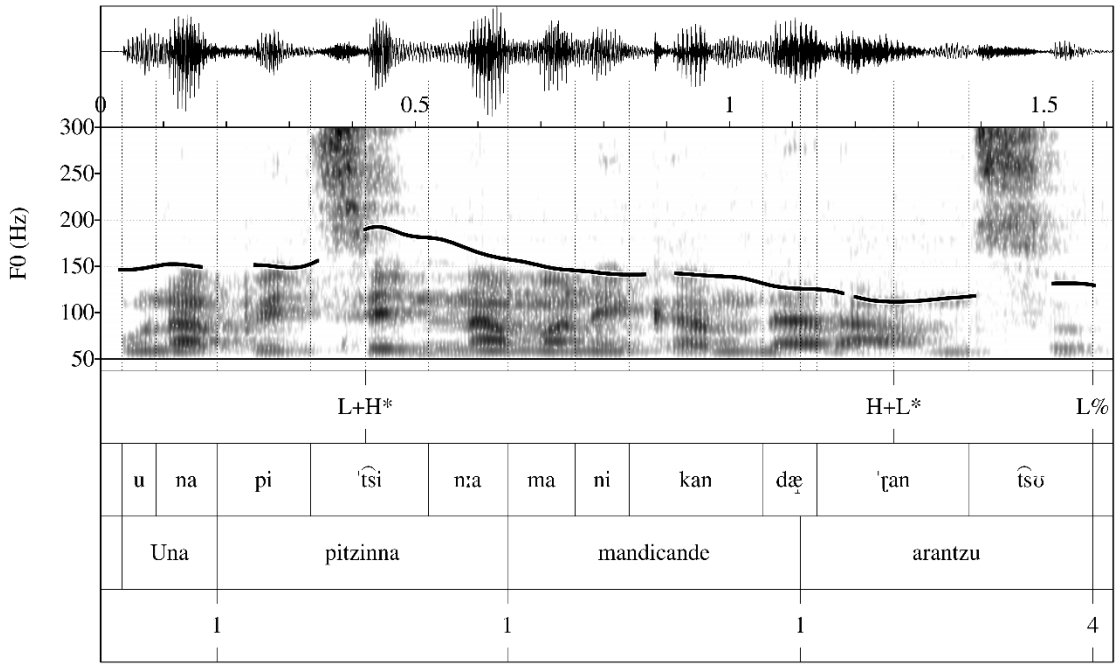


Figure 31.2: Lebanese Arabic (a) and Egyptian Arabic (b) realisation of narrow focus on the initial subject, from Chahal & Hellmuth (2014). As can be seen, post-focal words are deaccented in Lebanese Arabic, but not Egyptian Arabic.

(a)



(b)

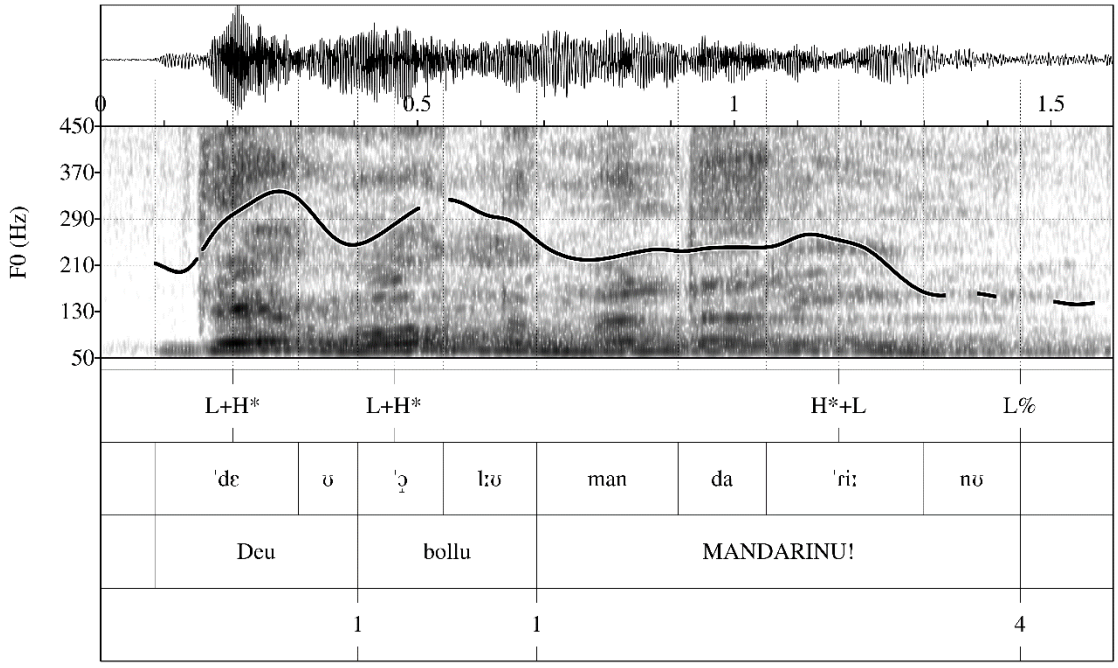


Figure 31.3: Broad focus (a) and contrastive focus (b) in Sardinian, from del Mar Vanrell et al. (2015).

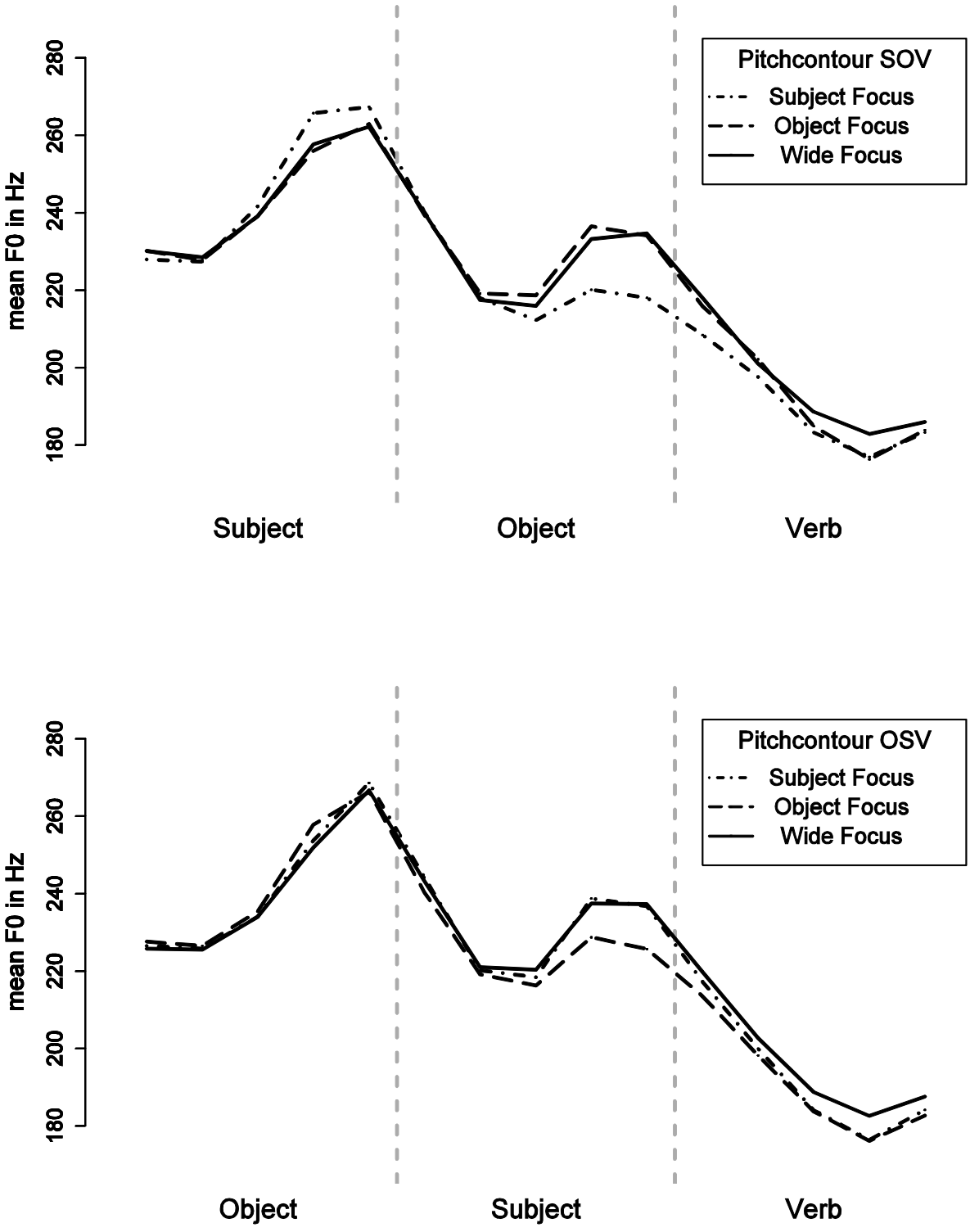


Figure 31.4: Time-normalized pitch tracks in different focus conditions in Hindi, based on five measuring points per constituent, showing the mean across 20 speakers. SOV (left) and OSV word order (right). The comparisons of interest are subject focus (dotted line) and object focus (dashed line) with respect to broad focus (solid line); from Patil et al. (2008: 61).