

Phrasal Stress

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Abstract

The representation of phrasal stress extends the representation of word stress upwards by at least two levels. These proposals on syntactic influences on phrasal stress are discussed: the NSR of Chomsky and Halle, the SAAR of Gussenhoven, and a proposal by Cinque. The results point towards the generalization that each syntactic XP must contain phrasal stress on the lower level, and that the last of these is strengthened on the level of the intonation phrase. Focus affects phrasal stress in two ways: (i) focus as captured in Rooth's alternative semantics of focus attracts phrasal stress, and (ii) given constituents reject phrasal stress.

1. Preliminaries

1.1. The representation of stress.

Word stress (Hayes 1995) is the strongest stress in a prosodic word. *Phrasal stress* is stress assigned beyond word stress in syntactic collocations of words, such as phrases, clauses, or sentences. Some examples that are discussed in this article are shown in (1) with word stress indicated by boldfacing.

- (1) a. [Who did you meet?] The **brother** of Mary
a. [Guess what.] The **mayor** of **Chicago** won their support.
b. [Who came to be party?] The **brother** of Mary **came** to the **party**.
c. German: [What did John do?]
Er hat Linguistik unterrichtet. Er hat in Ghana unterrichtet.
He has linguistics taught He has in Ghana taught
'He has taught linguistics.' He has taught in Ghana.'

In examples like these, it is felt that the (singly or doubly) underlined syllables are stressed more than the other boldfaced syllables in the same utterance. Among the underlined syllables, it is felt that the strongest stress of the utterances is on the element that is doubly underlined. This (singly or doubly underlined) addition to (boldfaced) word stress is phrasal stress, henceforth also *p-stress*.

The examples show an important property of the assignment of p-stress: In the words of Liberman and Prince 1977, stress is normally *preserved under embedding*. Syllables that show p-stress in the examples in (1) are always syllables that are independently determined to receive word stress by the rules of assigning word stress in English or German. P-stress is therefore assigned in the same representation as word stress, extending the representation upward, as shown in (2). Here an element with stronger stress than another one is dominated by a relatively higher grid-column.

- (2)a. (x) b. (x) p-stress
 (x) (x) (x)(x) word & word stress
 the bro ther of Ma ry Ma ry's bro ther

The dual representation in (2) in terms of constituents and grid-marks marking prominence has grown out of the dual theory of Liberman and Prince 1977 which employed metrical trees and grid-columns. Later arguments (Selkirk 1980, Halle and Vergnaud 1987, a.o.) have shown that stress (as represented by the grid-columns) should be seen as tightly tied to the constituents, so that a one-to-one relation between a constituent and the element with the strongest stress in it is assumed (see, for example, the *Faithfulness Condition* in Halle and Vergnaud 1987, Hayes 1995). A standard representation for this dual nature of the theory is the *bracketed grid* (Halle and Vergnaud 1987). I here use the bracketed grid representation of Hayes 1995, in which the grid-mark that marks the strongest element (head) of a constituent is drawn on the same line. (Minimally different dual representations are found in Halle and Vergnaud 1987, Cinque 1993, Nespore and Vogel 1986, 1989 and elsewhere.)

The constituents are called *metrical constituents* in accounts that make claims only about stress (Halle and Vergnaud 1987, Cinque 1993, Zubizarreta 1998); in these accounts, there are in principle arbitrarily many levels of such constituents, and they are typically thought to be directly identified with syntactic constituents.

The constituents are instead identified with *prosodic constituents* in some of the literature on phrasal phonology (Nespore and Vogel 1986, 1989). In this literature, there are a small number of specific such levels, each with phonological consequences in individual languages beyond their relevance in stress-assignment. The phenomena investigated in these terms have lead to the conclusion that prosodic constituents at the level of the prosodic word and above (phonological phrase, intonation phrase) are systematically related to syntactic constituents, but not identical to them (see also Selkirk 1986, 1995b and further references in section 2.7.).

1.2. Phrasal stress and intonation

Stress and the prosodic/metrical constituents provide the underpinning for the assignment of intonation contours in English. In the classical and still important theory of English intonation by Pierrehumbert 1980, Beckman and Pierrehumbert 1986, H and L tones that define the sentence melody are assigned in one of two forms: (a) as *pitch accents* (H*, L*, L*+H, L+H*, H*+L, H+L*); these are associated with stressed syllables; the star marks the tone that falls on the stressed syllable. (b) as *edge tones*; these anchor with the edge of *intermediate phrases* (H-, L-) or *intonation phrases* (H%, L%). These accounts of empirically observable intonation contours converge with the dual representation introduced above: intermediate phrase and intonation phrase are not only anchors for edge tones, but are also prosodic domains in which an element of strongest stress is defined. This element carries an obligatory pitch accent. The picture is extended to lower levels, where each accent is taken to be assigned to the strongest element of an *accentual phrase*. English does not have edge tones of the accentual phrase in this analysis, though other languages such as Japanese arguably do (Beckman and Pierrehumbert 1986, Pierrehumbert and Beckman 1988).

2. How is phrasal stress assigned?

The accounts of the assignment of p-stress agree insofar they acknowledge that focus as well as the syntactic structure have a role to play in this assignment.

2.1. Phrasal stress and focus

Let us first consider focus on single-word constituents. Core cases of focus involve stress on the asked-for constituent in an answer sentence (*Who likes Mary?* Bill likes Mary; vs. *Who does Mary like?* Mary likes Bill), as well as stress by contrast with another constituent (*John likes Mary. No, Bill* likes Mary; vs. *Mary likes John. No, Mary* likes Bill.) As the examples show, the context in which an utterance is used may direct the main stress of the sentence to different positions. Since Jackendoff 1972, the influence of focus is modelled in the theory of grammar with the help of an abstract feature F that is assigned to a syntactic constituent. In the case of question-answer pairs F is assigned to the asked-for constituent, thus *Who likes Mary?* [Bill]_F likes Mary. In the case of explicit contrast, F is assigned to the contrasted constituent, thus *John likes Mary; no, [Bill]F likes Mary. The focus F then has a semantic/pragmatic interpretation that relates the assignment of F to the context in which the sentence is used. At the same time, consequences of the presence of F for stress-assignment are defined. Following Jackendoff 1972, the strongest stress in the sentence has to be within the constituent marked F. Thus, in *Who likes Mary?* [Bill]_F likes Mary, the answer is correctly predicted to be stressed on the focused subject: [Bill]_F likes Mary.*

2.2. The Nuclear Stress Rule of Chomsky and Halle (1968)

Focus may be assigned to a larger constituent such as the subject of the sentence in (3a). The limiting case of this is what is sometimes called an *all-new sentence* and is here called a *sentence with no narrow focus*. An example is shown in (3b). (For concreteness, F is here assigned at the sentence level, but it depends on the theory of focus whether these sentences carry no focus or one all-embracing focus.) In these cases, F requires that the strongest stress is within F, but other rules or principles must come into play to determine where inside of F (or inside of the clause in (3b)) the strongest stress is assigned.

- (3) a. [Who came to be party?] [the **brother of Mary**]_F **came** to the **party**
b. [What happened?/Guess what:] [I **met** the **brother of Mary**]_F

An early proposal for English was the Nuclear Stress Rule (NSR) of Chomsky and Halle 1968. *The NSR assigns stress on the right*. (Its original formulation assigns stress cyclically. I return to the cyclic application below.) In (3a), then, we can say that the strongest stress must be within F, and that within F, the NSR assigns stress in rightmost position, thus on the rightmost word *Mary*. Similarly in (3b), where F does not limit the possibilities of stress-assignment in the sentence. The NSR here assigns rightmost stress, again on the word *Mary*. The two rules of stress-assignment within F, and there in rightmost position, make correct predictions about the location of the strongest p-stress in an English sentence for a considerable variety of cases.

2.3. Problems with the NSR

2.3.1. Head-final syntactic structures

The NSR does not generalize to languages with head-final structures in the syntax. While it correctly predicts strongest stress on the object that follows the verb in English (4a), it cannot predict strongest stress on an (unscrambled) object that precedes the verb in Dutch and German (4b).

- (4) a. [What did John do?] He was [teaching linguistics]_F
b. [What did John do?] Er hat [Linguistik unterrichtet]_F
he has linguistics taught

However, Dutch and German do not generally assign p-stress leftmost by a mirror image rule of the NSR. In the structures with adjuncts in (5), the rightmost element is the strongest in both English and German, though this is the adjunct in English but the verb in German. See Krifka 1984, Jacobs 1993 on the distinction between arguments and adjuncts in German. (Single underlining in (5) is discussed in a moment.)

- (5) a. [What did John do?] He was [teaching in Ghana]_F
b. [What did John do?] Er hat [in Ghana unterrichtet]_F
he has in Ghana taught

2.3.2. More than one phrasal stress in the sentence

Sentences with no narrow focus like [*the mayor of Chicago*] [won their support] show more than one p-stress, as indicated. For a case like this, a cyclic application of the NSR correctly assigns p-stress (Selkirk 1984): In the subject [*the mayor of Chicago*] the NSR assigns rightmost stress; likewise in the constituent [won their support]. When the two parts are put together the NSR applies on the sentence level and correctly strengthens the rightmost p-stress: [*the mayor of Chicago*] [won their support].

Gussenhoven observed that the NSR does not always correctly assign p-stress that is not the strongest stress of the sentence in English. In (5a), where the verb precedes an adjunct, the verb also receives p-stress. However, in (4a), where the verb precedes an argument, the verb does not receive p-stress. The contrast is subtle, but Gussenhoven 1983a conducted an experiment that showed that the contrast is real.

2.4. The Sentence Accent Assignment Rule of Gussenhoven 1983b, 1992

Gussenhoven 1983b, 1992 suggested the Sentence Accent Assignment Rule (SAAR) as a solution to the problems just reviewed. The SAAR is presented as a rule assigning accent directly. For the purpose of the discussion here, the perspective of Pierrehumbert 1980, Beckman and Pierrehumbert 1986, Hayes and Lahiri 1991, Hayes 1995 is adopted by which (phrasal) stress is assigned first, and then serves as the anchor for pitch accents. The SAAR is accordingly decomposed into two steps here: (i) assignment of p-stress relative to the syntax, and (ii) assignment of a pitch accent to each element carrying p-stress. Here (i) is of primary interest.

The *core of the SAAR* says this: Within a focus, *every predicate, argument, and modifier, must be accented (here: receive p-stress), with the exception of a predicate that stands next to an accented argument*. Thus, in (5), each adjunct (*in Ghana*) receives p-stress, and the verbs (predicate) also receive p-stress. In (4), the arguments (*linguistics/Linguistik*) receive p-stress, but in both languages, the verbal heads next to the stressed arguments do not receive p-stress (*teaching/unterrichtet*).

(In reducing the SAAR to its core, I am leaving out a part of the SAAR that, in my assessment of the empirical situation, concerns the interaction of stress-assignment and movement; see Bresnan 1971, Gussenhoven 1992.)

2.5. The strongest phrasal stress

The SAAR not only assigns p-stress correctly in a wide range of cases, it also provides the correct input for defining the position of the strongest stress: As made formally explicit in similar terms by Uhmann 1991 for German, by Hayes and Lahiri 1991 for Bengali, and by Selkirk 1995a for English: *the rightmost p-stress in the intonation phrase is strengthened to the strongest stress*. For the examples in (4b) and (5b), this is shown in (6).

(6)	(x)	(x)	strongest phr.s.
	(x)	(x)	any phr.s.
	(x)	(x)	word stress
	Er hat Linguistik unterrichtet			Er hat in Ghana unterrichtet			

Similarly in *he was teaching in Ghana* and in [*the mayor of Chicago*] [*won their support*]. This suggestion is thus similar to the NSR, but applies in the prosodic domain of the intonation phrase, rather than in a syntactic domain.

A syntactically defined alternative is the *C-NSR* of Zubizarreta 1998. The accented elements stand in a syntactic relation of asymmetric c-command relative to each other. For example, the subject of a clause asymmetrically c-commands the object. Zubizarreta assigns stronger stress to the element lower in the chain of asymmetric c-command, thus, the object as opposed to the subject. This suggestion makes stronger typological predictions, excluding languages in which stress is assigned leftmost in the intonation phrase. On the other hand, Szendrői 2001 argues that Hungarian is a language in which the leftmost stress in the intonation phrase is strengthened.

2.6. The SAAR and depth of embedding

Cinque 1993 took the implementation of the NSR in Halle and Vergnaud 1987 as a starting point and sought to develop a revised cyclic theory that would account for main stress on the preverbal object in Dutch and German in examples like *Linguistik unterrichten*. Cinque's idea was that the greater amount of syntactic embedding of the complement ([_{DP} [_{NP} [_N Linguistik]]] vs. [_V unterrichten]) would give rise to more cycles and thus, he postulated, to higher stress than on the following head. Cinque's theory does not seek to account for secondary stress, and thus misses the generalizations captured by the two-level analysis employing the SAAR that we saw above. It also runs into empirical problems in cases where one can rigorously test the claim that greater depth of embedding leads to greater stress. Thus, in German examples like (7), one can

make the first (indirect) object arbitrarily heavy, the strongest stress will always be on the second (direct) object. Cinque's theory wrongly predicts that there will be a point at which the indirect object is more deeply embedded than the following constituent, and then attracts main stress.

- (7) Der **P**eter hat
 IO [der [**S**chwester [des [**F**reundes [von [**M**aria]]]]]]
 DO V [[eine [**R**ose]] **g**eschenkt]
 'Peter has given [a rose] to [the sister of the boy-friend of Maria]'

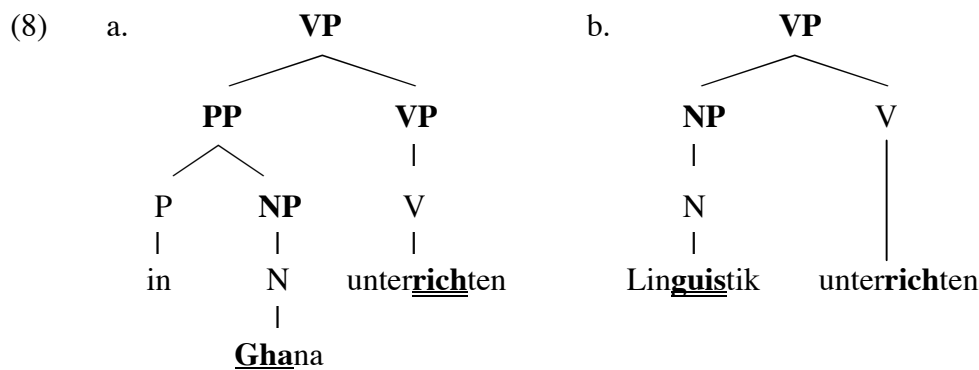
This case exemplifies a more general problem for Cinque's account: among two XPs not contained in each other (such as subject and VP-adjunct, subject and object, VP-adjunct and object, object and object), depth of embedding never determines which stress is the strongest. They each receive stress, but the strongest one is the rightmost p-stress, as predicted by the accounts in terms of the SAAR plus strengthening of the final one. Thus, depth of embedding does not generalize from complement-head relations to other cases as a predictor of main stress. (Cinque noticed some of the problems arising this way and proposed an addition to the theory that removes the prediction on the non-recursive side of a syntactic head. This provision does not help in (7): The left side must be the recursive side of the German verb, otherwise the normal object-verb configuration cannot be derived. But then a further object as in (7) is also on the recursive side of the German verb.)

2.7. The SAAR and syntactic XPs

The notion XP plays an important role in a central line of research in phrasal phonology. Chen 1987 argued that in Xiamen Chinese, the right edge of a syntactic XP coincides with a tone group boundary, with some systematic exceptions. Building on a variety of languages, Selkirk convincingly generalized that account and argued that in some languages, the right edge of XP is aligned with phonological phrase edges (Xiamen Chinese, Chi Mwi:ni: Selkirk 1986; Tohono O'odham: Hale and Selkirk 1987) and that in other languages, the left edge of XP is aligned with phonological phrase edges (Japanese: Selkirk and Tateishi 1991; Shanghai Chinese: Selkirk and Shen 1990). The two constraints, cast in terms of Optimality Theory in Selkirk 1995b, are Align-XP,R and Align-XP,L. Edge alignment was extended to Maori by de Lacy 2003, who argues that Align-XP,L and Align-XP,R are simultaneously at play in this language, and to the Bantu languages Chichewa and Kimatumbi in Truckenbrodt 1995, 1999, where Align-XP,R is argued to interact with a constraint Wrap-XP that punishes dividing XPs into more than one phonological phrase.

The notion XP, which seems to independently play a central role in the syntax-phonology interface, also provides a generalization over *predicates, arguments, and modifiers, with the exception of predicates next to an accented argument* in the SAAR. Thus, a more principled formulation of the SAAR that is defended in the following is: ***Each XP is assigned a beat of phrasal stress.*** This is the content of the constraint ***Stress-XP*** proposed in Truckenbrodt 1995 to account for patterns of phonological phrasing in languages other than English, Dutch or German. (It is not related to the SAAR there.) P-stress is there construed as stress on the level of the phonological phrase (Nespor and Vogel 1986, 1989).

For the purpose at hand, the application of Stress-XP to two core cases of the SAAR is shown in (8). (8a) is a standard syntactic representation of a syntactic adjunct: The adjunct is a phrase, and the element it adjoins to (here VP) is likewise a phrase. In this configuration, Stress-XP demands p-stress in the adjunct XP as well as p-stress in the element next to it, which is itself a phrase (it is dominated by one of the VP-nodes; this VP-node, by Stress-XP, requires p-stress; see Truckenbrodt 1999 for more detailed discussion of adjunction structures in the syntax-phonology mapping; the matter is formally more complex, but for the case at hand, the more detailed suggestions there have the same consequences as the simplified discussion here.). (8b) is a standard syntactic representation of an argument next to its selecting head. The argument is itself a maximal projection XP, and a sister to a head, X. Here Stress-XP demands stress in the argument XP, but it does not demand stress inside of its sister, which is only a head X (here: V). Further, so long as the argument is stressed, Stress-XP is also satisfied for the VP in (8b), which contains stress in the position of the stressed argument.



Thus, the special status of *predicates next to an accented argument* in the SAAR finds a simple explanation: while the other categories listed in the SAAR (in particular arguments and adjuncts) are XPs, predicates next to an accented argument are heads (X) that are not affected by Stress-XP. Where the predicate does not have an argument, it stands alone in its XP like the lower VP in (8a), and thus correctly requires stress by Stress-XP. Where the argument of a verb is not accented (as in *to* [_{VP} *read* something], in German [_{VP} *etwas lesen*]), Stress-XP also correctly requires p-stress in the VP. In this case, the object rejects stress (see section 3.3.), so the p-stress within VP falls on the verb.

I offer a new application of a proposal of my own in this review of the literature, since I believe that it is a step ahead relative to the other proposals: In other accounts of p-stress, including in particular Gussenhoven's SAAR, Zubizarreta 1998, Büring 2001 as well as Selkirk 1995a, the special status of the head-argument relation is written into the rules or constraints that relate syntactic and prosodic structure. Stress-XP, on the other hand, requires no statement about the head-argument relation or about any other syntactic relations. Rather, the special assignment of stress in the head-argument configuration is derived directly from the special syntax of the head-argument configuration: This is the only case in which an XP (such as VP) contains another XP (such as the argument) and a non-XP (such as the verb). If each XP must contain p-stress, it follows that the argument XP must contain p-stress, but the head (non-XP) need not.

In Selkirk's theory, the account in terms of the two kinds of focus, F and FOC, is integrated with a mechanism of percolation of F that accounts for the generalizations discussed in terms of the SAAR / Stress-XP above. Schwarzschild 1999 shows a number of empirical problems with the mechanism of focus feature percolation. They include an argument (p.171ff) that the default stress-relation between heads and arguments is independent of the distribution of F and FOC. This is as predicted by the account in terms of Stress-XP.

Schwarzschild 1999 also explores the notion that F is interpreted as an exemption from givenness, and that FOC need not be semantically interpreted, i.e. that the semantics of focus need not include a requirement that the context provides alternatives to FOC. Schwarzschild's suggestions leave open many questions in regard to how his suggestions are to be combined with mechanisms of default assignment of accent/p-stress.

To connect the discussion of focus with the earlier discussion in a way that is intuitively accessible in the frame of this article, I put things together as in (12).

- (12) (a) FOC, semantically interpreted as in Rooth's (1992) theory of focus, contains phrasal stress;
 (b) Avoid phrasal stress on contextually given constituents;
 (c) Stress-XP: Each XP contains phrasal stress.
 (d) Strengthen the last phrasal stress of the intonation phrase.

(12a) invokes Rooth's theory of focus, plus the requirement from Schwarzschild that FOC contain p-stress. (12b) summarizes the prosodic effect of givenness, as discussed in this section. Both take precedence over the constraint (12c) that connects the syntactic structure to p-stress.

Jackendoff's requirement that the focus contains the strongest stress here comes out of (12b): A successful assignment of FOC in line with Rooth's theory will be surrounded by given material, so that (12b) forces the main stress of the intonation phrase away from the given material and into FOC. (12a) is required for a number of examples in Schwarzschild's discussion, such as: (*John cited Mary*) but he *DISSED SUE*. Here the p-stress on the verb *dissed* is assigned in connection with the alternative *cited* in the preceding clause. This is mediated by FOC, which must therefore have the effect of introducing p-stress (Schwarzschild 1992, p.170; other examples are found on pp.171ff).

(12b) is formally not in line with the conceptualization otherwise adhered to since Jackendoff (1972): that semantics (givenness) and phonology (p-stress) are not directly connected. Instead, they should be mediated by focus-features in the syntax. In Selkirk 1995a and Schwarzschild 1999 this mediation is taken on by the feature F (in difference to FOC), which is avoided in (12) to keep things simple in this outline.

3.3. Pronominal elements

Definite pronouns like *she*, *his*, ... as well as indefinite pronouns like *something*, *someone* are XPs (DPs) but do not show the stress expected of XPs (unless narrowly focused): *Mary likes John*. But: *She likes him*. *Mary likes someone*. This can be subsumed under the general requirement of destressing of given material (see (12b)). The definite pronouns are referentially given by coreference with an element in the

context (van Deemter 1994, Schwarzschild 1999). The indefinite pronouns *something* and *someone* can also be construed as given: Every context entails the presence of something and of someone. By the avoidance of F-marking in Schwarzschild 1999 (i.e. by interpreting constituents as given as much as the context allows), these elements *can* be interpreted as given, and therefore they *must* be interpreted as given. Therefore they must be destressed.

4. Summary

Phrasal stress is assigned in a representation with constituents and prominence, extending the prosodic or metrical representation of stress within the word upward. Focus and syntactic structure both have a role in shaping the pattern of p-stress in a given utterance. Contextually given elements avoid phrasal stress, and elements contrasted with alternatives seem to require phrasal stress. Where focus does not interfere, a combination of two simple generalizations seems to go a long way in accounting for observed patterns: Each XP contains a beat of phrasal stress (generalizing over the core of Gussenhoven's SAAR) and the final phrasal stress thus assigned in the intonation phrase is strengthened.

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