Elisabeth Selkirk Sentence Phonology, *International Encyclopedia of Linguistics*, 2nd ed. Oxford University Press, 2003.

The surface phonological representation of a sentence consists of a segmental representation (root nodes and segmental features), a tonal representation, and a prosodic structure representation, the latter consisting of a hierarchical representation of prosodic constituents as well as a representation of the prominence (head) of each constituent. According to the *prosodic structure hypothesis*, prosodic structure organizes sentence phonology and phonetics just as it does word phonology and phonetics (Selkirk 1978 et seq, Nespor and Vogel 1986, Pierrehumbert and Beckman 1988). The constituents of the prosodic hierarchy most directly relevant to sentence phonology are the prosodic word, the minor and major phonological phrases (aka accentual and intermediate phrases), the intonational phrase and the utterance, in that order. These constituents and their prominent heads, claimed to be universally present, constitute the structure with respect to which phonological and phonetic phenomena are defined.

Tonal phenomena are perhaps most revealing of the categorical organization of the sentence into prosodic constituents. The tones playing a role in sentence phonology have various sources. There are tones which are contributed by the lexical representation of individual words, there are tones that are phrase-level morphemes, and there are tones that are epenthetic. Sentence-final tonal morphemes indicating the role of a sentence in a discourse like the declarative low (L) boundary tone of English, appear in all types of languages. Other tonal morphemes seen in the sentence may be indicators of the focus status of a constituent, as with the focus H tone in Swedish (Bruce 1977), or various of the pitch accents of English-- H*, L*, L+H*, L*+H (Pierrehumbert and Hirschberg 1990). Some tones that appear in the sentence are apparently neither lexical nor morphemic but rather epenthetic, present to satisfy phonological constraints. Phonological constraints determine the precise location in the sentence of these various sorts of tones and tend to produce representations in which individual tones align with either the prominent head of a prosodic constituent or with the edge of a constituent. In Bengali (Hayes and Lahiri 1991), a default tone is epenthesized on the prominent syllable of a phonological phrase. In English, pitch accent morphemes , plausibly generated as part of the morphosyntax of the sentence, are drawn to phrasally prominent syllables, while in Chichewa (Kanerva 1989), a lexical H tone in a word shifts its position in order to coincide with a phrasal prominence. The edges of prosodic phrases are also a standard location for tone. In Bengali (Hayes and Lahiri 1991) and Japanese (Pierrehumbert and Beckman 1988) epenthetic tones mark the edges of major and minor phonological phrases, respectively. It is conceivable as well that the presence of certain tonal morphemes in particular locations in surface morphosyntactic representation, such as the continuation H tone of English, may induce the presence of a prosodic phrase edge at that location in surface phonological representation. Aside from constraints calling for the coincidence of tones and prosodic heads or edges, there are also constraints which call for the spreading of tone, or which rule against certain sequences of tone, and so on, and these too appeal to prosodic constituent structure. For example, for a tone to spread from one syllable to another, the syllables must be adjacent within a particular prosodic constituent (see Myers 1987 on Shona). A prosodic constituent may thus constitute the domain within which a phenomenon takes place.

Prosodic structure also organizes sentential segmental phonology and phonetics. Recent phonetic work shows that the left edge of different levels of prosodic constituent structure is the locus of articulatory strengthening, for example, the introduction of a prevocalic glottal stop in English (Dilley and Shattuck-Hufnagel 1996) , or the degree of linguopalatal contact of /n/'s in French (Fougeron and Keating (1997)). Moreover, external sandhi phenomena are restricted by prosodic structures as documented in Nespor and Vogel 1986, among others. For example, in Bengali (Hayes and Lahiri 1991), a word-final *r* assimilates completely to a following coronal consonant just when this segmental sequence lies within the same phonological phrase:

(1) (ʃæ^{L*}moli $^{H-}$) (ra^{L*}m-er bari $^{H-}$) (Î^{h}u^{L*}ketß^{h}il $^{H-}$)$^{L\%}$
Shamoli Ram's house entered "Shamoli entered Ram's house."

(2) (ø^{L*}mor $^{H-}$) (tßa^{L*}dor $^{H-}$) (ta^{L*}ra-ke $^{H-}$) (díe^{L*}tß^{h}e $^{H-}$)$^{L\%}$
[r] [tß] [r] [t]
Amor scarf Tara –to gave "Amor gave the scarf to Tara."

(3) (ø^{L*}mor tßador tara-ke^{H-}) (díe^{L*}tß^{h}e $^{H-}$)$^{L\%}$ [faster speech]
[tßtß] [tt] "Amor gave the scarf to Tara."

Note that in this Bengali case the prosodic constituent relevant for defining the domain of assimilation is exactly the one relevant for determining the presence of the epenthetic H phrase edge tone, and for determining the presence of the phrasal prominence which receives an epenthetic L* pitch accent. This is an example of the *domain convergence* that the prosodic structure hypothesis predicts: it is expected that distinct types of phonological phenomena may converge on the same prosodic constituent structure, collectively providing important evidence for that constituency in the first place.

Prosodic structure is itself determined by various kinds of constraints. There are phonological constraints on prosodic structure per se, construable as prosodic markedness constraints. A basic type are constraints on prosodic domination , which require that, in the unmarked case, prosodic structure is *strictly layered,* in the sense that a constituent of a higher level in the prosodic hierarchy immediately dominates only constituents of the next level down in the hierarchy (see Selkirk 1995). One further sub-type are alignment constraints calling for the alignment of edges of prosodic phrases and prosodic phrasal prominences (Truckenbrodt 1995). And another are constraints on the size, specifically the binarity, of prosodic constituents (Selkirk and Tateishi 1988, Selkirk 2000). The existence of these properly phonological constraints on the domain structure of phonology provides one of the strongest arguments for the autonomy of this (prosodic) domain structure from the surface morphosyntactic structure of the sentence. Alongside these phonological constraints on phonologically relevant higher order structure, there are constraints which call for a certain faithfulness to the morphosyntactic structure of the sentence. Selkirk 1986 proposes a class of constraints which require that the edges of designated syntactic constituents in morphosyntactic structure (word, maximal projection) align with the edge of corresponding constituents in prosodic sructure. Truckenbrodt 1995 proposes that the Focus representation of a sentence is reflected in the

prosodic prominence structure of the sentence. An understanding of the precise ways in which the information structure and constituent structure of surface morphosyntactic structure impinges on the surface phonological structure continues to be a matter of current research.

Current models of grammar construe the phonological and morphosyntactic output representations as being co-present and therefore allow in principle that phonological constraints other than the quite general faithfulness constraints cited above might include direct appeals to morphosyntactic conditions. A strong version of the prosodic structure hypothesis holds that effects of morphosyntactic structure on sentence phonology and phonetics are never direct, but always mediated by prosodic structure (Selkirk 1986, Nespor and Vogel 1986), while a weak version of the hypothesis would allow that some constraints on phonological phenomena also have direct access to morphosyntactic representation (Kaisse 1985). The co-presence of phonological and morphosyntactic output representations also raises the question whether phonological constraints ever determine aspects of surface morphosyntactic form (Inkelas and Zec 1990). Some (e.g. Vallduví 1991, Zubizarreta 1998) have proposed that the phonological imperative to align a phrasal prominence towards the right end of a sentence might be responsible for the (syntactic) ordering of nonfocus, non-phonologically prominent, constituents away from the right edge. Further research on these questions needs to be carried out in order to determine just what phonology-syntax interactions are possible.

Bruce, G. 1977 *Swedish Word Accents in Sentence Perspective*. Lund: Gleerup.
Dilley, L. and S. Shattuck-Hufnagel 1996 Glottalization of word-initial vowels as a function of prosodic structure. *Journal of Phonetics* 24, 423-444.
Fougeron, C. and P. Keating 1997 Articulatory Strengthening in prosodic domain-initial position. *Journal of the Acoustical Society of America* 101, 3728-3740.
Hayes, B. and A. Lahiri 1991. Bengali intonational phonology. *Natural Language and Linguistic Theory* 9, 47-96.
Inkelas, S. and D. Zec 1990 Prosodically Constrained Syntax. In *The Phonology-Syntax Connection*, edited by S. Inkelas and D. Zec. Chicago: University of Chicago Press/CSLI, 365-378.
Kaisse, E. M. 1985 *Connected Speech: The Interaction of Syntax and Phonology.* San Diego: Academic Press.
Kanerva, J. 1989 *Focus and Phrasing in Chichewa Phonology.* Ph.D. dissertation, Stanford University.
Myers, S. 1987 *Tone and the Structure of Words in Shona*. Ph.D. dissertation, University of Massachusetts, Amherst.
Nespor, M. and I. Vogel 1986. *Prosodic Phonology.* Dordrecht: Foris.
Pierrehumbert, J. and M. Beckman 1988 *Japanese Tone Structure.* Cambridge, MA: MIT Press.
Pierrehumbert, J. and J. Hirschberg 1990 The meaning of intonational contours in the interpretation of discourse. In *Intentions in Communication,* edited by P.R. Cohen, J. Morgan and M.E. Pollock. Cambridge, MA, MIT Press: 271-311.
Selkirk, E. 1986 On derived domains in sentence phonology. *Phonology* 3, 371-405.
Selkirk, E. 1995 The prosodic structure of function words. In *Papers in Optimality*

Theory, edited by. J. Beckman, L. Walsh Dickey and S. Urbanczyk. Amherst, MA: GLSA Publications**:** 439-470.

Selkirk, E. 2000 The interaction of constraints on prosodic phrasing. In *Prosody: Theory and Experiment,* edited by M. Horne. Dordrecht: Kluwer, 231-262.

Selkirk, E. and K. Tateishi 1988 Constraints on minor phrase formation in Japanese. In *Proceedings of the 24th Annual Meeting of the Chicago Linguistics Society*. Chicago: Chicago Linguistic Society, 316-339.

Truckenbrodt, H. 1995 *Phonological Phrases: Their Relation to Syntax, Focus and Prominence*. Ph.D. dissertation, Department of Linguistics, MIT.

Vallduví, E. 1991 The role of plasticity in the association of focus and prominence. In *Proceedings of the Eastern States Conference on Linguistics (ESCOL)* 7, 295-306.

Zubizarreta, M. L. 1998 *Prosody, Focus and Word Order.* Cambridge, MA: The MIT Press.