

The Discontinuous Intonation Contour: A Case for Rethinking Intonation Contour/Intonation Phrase Isomorphy

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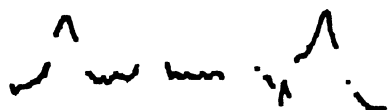
## The Discontinuous Intonation Contour: A Case for Rethinking Intonation Contour/Intonation Phrase Isomorphy

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Imagine the following utterance occurring in a news broadcast following a local election:

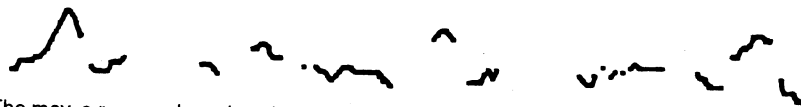
'Although the rest of the city incumbents went down to defeat in yesterday's election, the mayor was re-elected handily.'

Here is the intonation contour for the last clause of the sentence:



The mayor was reelected handily.

Now, if the same clause included a medial non-restrictive relative clause, giving new information about the mayor, the intonational shape of the entire clause complex might very well be:



The mayor, whose husband is unemployed, was reelected handily.

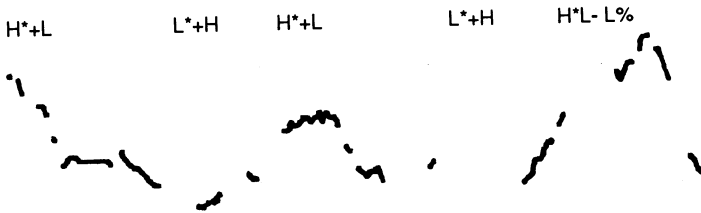
Within the framework of Prosodic Phonology, this utterance would be accounted for as containing three intonational phrases, each associated with a separate intonation contour. Missing from such an account, however, is the observation that the shape of the contour of the first sentence is identical, with respect to gross tonal structure, to that of the combined intonational strings associated with the segments of the utterance which have been interrupted by the medial relative clause. I suggest that such an interrupted contour, hereafter called the Discontinuous Intonation Contour (DIC), cannot be adequately accounted for by the standard theory of prosodic phonology, which posits a strictly linear and adjacent series of intonational phrases isomorphic to intonation contours.

The system for describing the structure of intonation contours (hereafter ICs) that will be assumed in this study is that developed in Pierrehumbert 1980 and later extended in Beckman & Pierrehumbert 1986, Pierrehumbert & Beckman 1988, and Pierrehumbert and Hirschberg 1990, which posits two levels of tones, low and high, which are associated with three pitch loci: the pitch accent, phrase accent, and boundary tone. Pitch accents are tones associated with stressed syllables. The phrase accent 'controls the pitch in the region between the last accent and the boundary tone' (Hayes & Lahiri 1991:52). The boundary tone is that associated with the terminal boundary of the contour.

In keeping with the Pierrehumbert model of IC description, it will be maintained here that '[t]he well-formed [ICs] for an intonation phrase are comprised of one or more pitch accents followed by a phrase accent and then a boundary tone' (Pierrehumbert 1980:9). These three components are realized even in the shortest mono-syllabic utterance. Here, H\* is the pitch accent, L- is the phrase accent, and L% is the boundary tone:

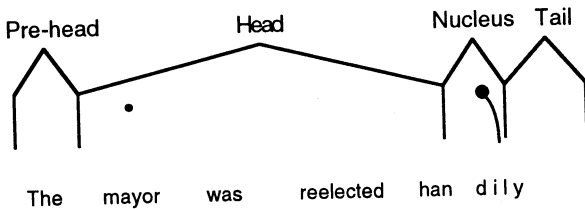


Complex contours can combine multiple bi-tonal pitch accents:



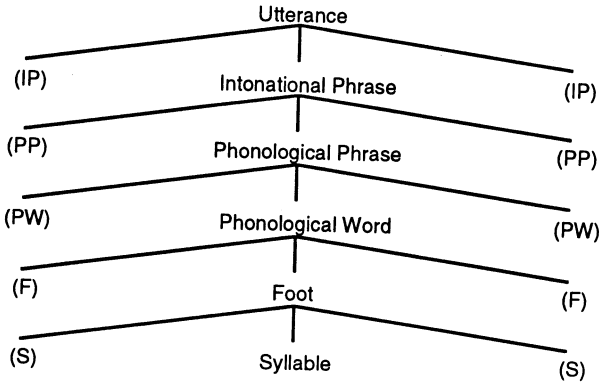
[He] beat around the bush and ended up by saying, 'Oh!'

In addition to the obligatory pitch accent/phrase accent/boundary tone configuration, it will also be assumed that a well-formed IC contains a uniquely prominent pitch accent or--in the British terminological tradition--nucleus. Here, the unique prominence of the second pitch accent is acknowledged by identifying it as the nucleus of the IC.

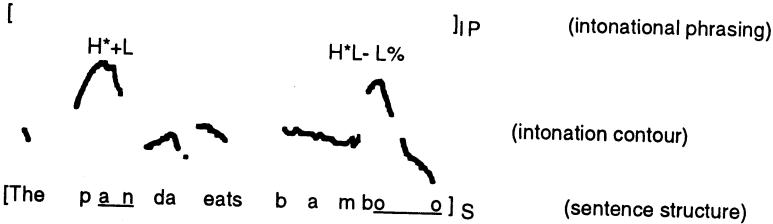


In summary, a well-formed IC consists, from left to right, of 1) one or more pitch accents, the last of which is nuclear, 2) one phrase accent, which provides a tonal transition between the nuclear accent and the end of the IC, and 3) one boundary tone, which establishes the tonal level at the terminus of the IC.

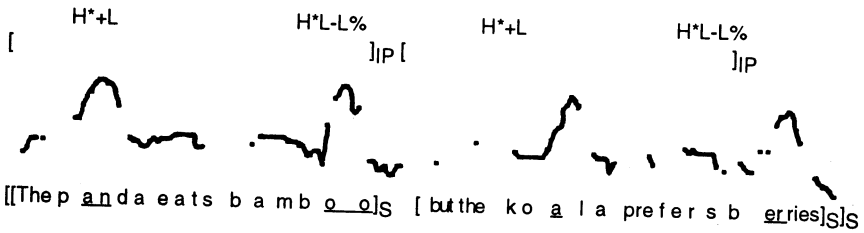
The IC plays an important role in the theory of prosodic phonology, originally formulated by Selkirk and expanded in later work by Selkirk (1980a, 1980b, 1981, 1984, 1986) and Nespor & Vogel (1982, 1986). Prosodic structure represents 'a suprasegmental, hierarchically arranged organization to the utterance, not a simple linear arrangement of segments and boundaries' (Selkirk 1978:111).



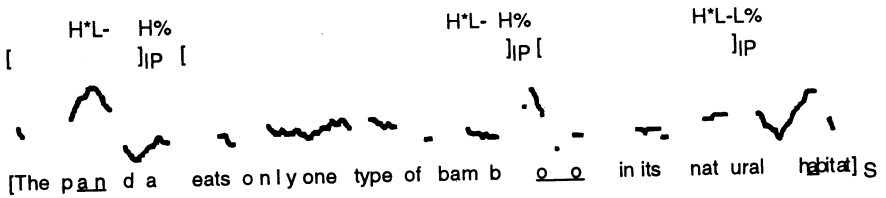
In the prosodic hierarchy, the intonational phrase (hereafter IP) is dominated by the utterance (U) and dominates the phonological phrase (PP). According to the theory, 'an intonational phrase is a unit of prosodic constituent structure with respect to which the characteristic intonational contours of a language are defined' (Selkirk 1984:197). This one-to-one mapping of ICs to IPs is a crucial component of the model. The corollary Strict Layer Hypothesis requires that each level of the prosodic hierarchy consist exclusively of constituents of that level's type and that constituents at any given level are exhaustively dominated by those of the next higher level. The following sentence contains a single clause, IP, and IC.



Multiple IPs are identified in sentences with multiple clauses,



or sentences in which single IPs have been restructured according to certain syntactic or performance conditions--such as the presence of clear pause:

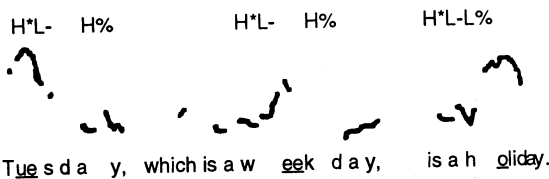


Recent work by Ladd (1986, 1992) and Gussenhoven (1988, 1990) represents significant movement away from the tenets of standard prosodic phonology at the level of the IP. The essential notion from which these analyses emerge is captured in Gussenhoven's claim that '[d]omains for intonational structure should be mapped onto prosodic constituents, but they cannot consistently be mapped onto any particular prosodic constituent' (Gussenhoven & Rietveldt 1992:89). Although it is not possible to explain or exemplify this work here, it should be noted that it presents convincing evidence bringing into question a necessary one-to-one relationship between ICs and IPs. However, none of their discussions specifically treats the phenomenon I have called the discontinuous intonation contour, an IC which, although rendered discontinuous by the presence of an interrupting string, is nevertheless describable as an individual unit which is not isomorphic to an IP.

The presence of certain syntactic structures in sentences mandate an obligatory IP, e.g. non-restrictive relative clauses, direct quote ascriptions, tag questions, vocatives, and preposed adverbials. When the structure in question is sentence-medial, the sentence, under the standard analysis, has three IPs--one formed by the sentence-medial structure and one each formed by the strings to the left and right of it:

[Tuesday,]IP [which is a weekday,]IP [is a holiday.]IP

This requirement is in keeping with the Strict Layer Hypothesis, which mandates that adjacent constituents at a specified level in the prosodic hierarchy be of the same type. Since an IP boundary exists to the left and right of the sentence-medial structure, the remaining strings on both sides of the structure must form their own IPs. Crucially, since IPs and ICs are isomorphic, the intonational material associated with each of these strings is identified as a separate IC, each with its own pitch accent, phrase accent, and boundary tone:



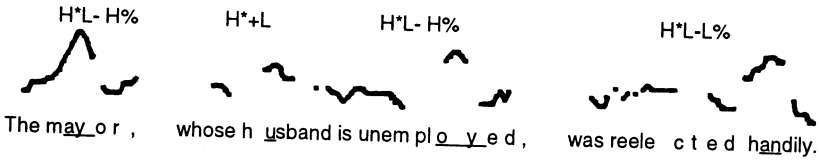
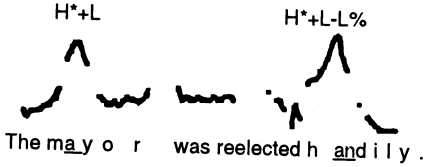
Since the ICs associated with each of the three IPs are easily identifiable as well-formed structures with respect to the pitch accent account of Pierrehumbert, there is no problem with a one-to-one IC/IP mapping in this case. However, the standard model does not account for certain phenomena of ICs seen in sentences

containing the kinds of sentence-medial syntactic structures in view here. Consider again the following two utterances:

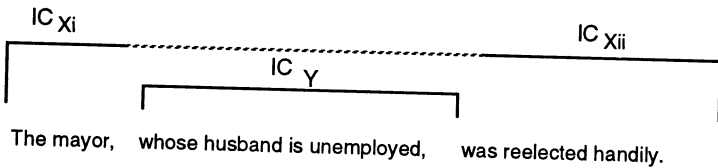
[The mayor was re-elected handily.]IP

[The mayor,]IP [whose husband is unemployed,]IP [was re-elected handily.]IP

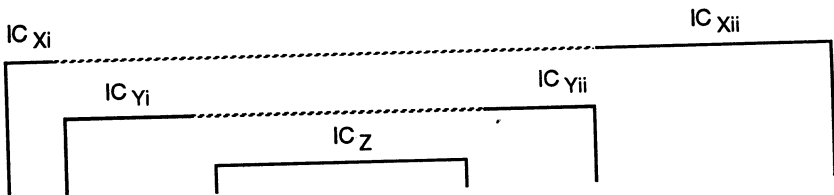
The first sentence contains only one obligatory IP, whereas the second contains three. Note the IC structure of the two sentences:



The standard formulation for this utterance does not capture the observation that the actual phonetic shape of the intonational contour of the combination of the material to the left and right of the medial IP is essentially identical to that of the first sentence without the medial structure. If one posits a sequentially discontinuous yet phonetically unitary IC to account for this phenomenon, the second sentence can be accounted for as having three IPs, yet only two ICs: one continuous, associated with the sentence-medial structure, and one discontinuous, associated with the combined material to the left and right of that structure:



ICY is embedded in the discontinuous IC<sub>X<sub>i</sub>+<sub>i</sub></sub> in a fashion parallel to the embedding of the relative clause in the root sentence. Such embedding could conceivably involve an unlimited number of levels. Here, there are five IPs yet only three DICs:



John, the real hero— and I mean that sincerely— of the trip, ended up with frostbite.  
 [ ]IP[ ]IP[ ]IP[ ]IP[ ]IP

Other sentence types further illustrate the phenomenon: a yes/no question...

^

Do you really think you can get away with this?

...with an adverbial,

Do you really think, as a rational human being, you can get away with this?

a wh-question...

Which poor player do you intend to penalize now?

...with an expletive,

Which poor player -- damn it! -- do you intend to penalize now?

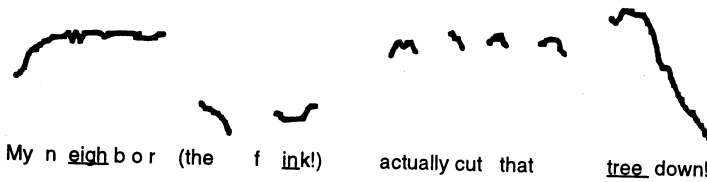
and an exclamatory...

What a groovy trip this vacation is!

...with an adjectival.



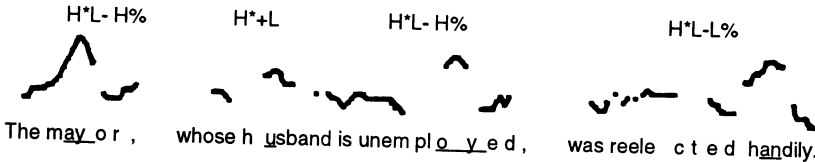
Vivid evidence for the stability of the DIC can be found in utterances with an especially wide pitch range. The resetting of tone after a sentence-medial obligatory IP in order to preserve the stability of the contour of the DIC can sometimes be fairly dramatic:



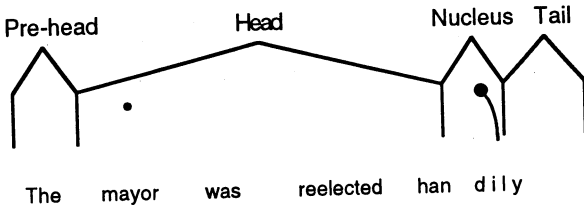
Incidentally, the fact that a given speaker might intone the two separate components of a DIC differently than the uninterrupted contour is not an important argument against the notion of a DIC. Choices made by speakers in intonation vary greatly depending on numerous conditions including attitude, information structure (such as given/new, focus, etc.), interactional context, and personal style.

On the standard account, commitment to a linear organization of IPs demands that the ICs associated with them be described as independent wholes, 'each with its own defining characteristics' (Selkirk 1978:130). This assumption, however, fails to account for important differences in the internal structure of the individual strings of tonal material to the left and right of a sentence-medial structure and of the complete DIC itself.

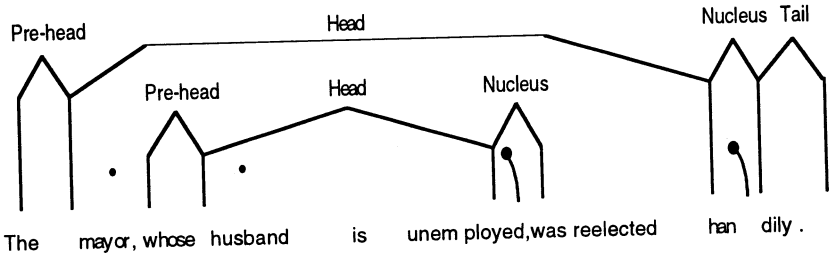
If each IC associated with an IP is a complete contour containing all requisite components, then each of the three ICs of an utterance containing a sentence-medial IP should be well-formed. In many cases, of course, the pitch accent algorithm can be applied to each of the tonal strings, producing three well-formed sequences. For example,



What is missing here, however, is any account of the nuclear accent in the DIC. A nucleus-based treatment of the IC of the utterance without the embedded structure shows a nuclear accent near the end.

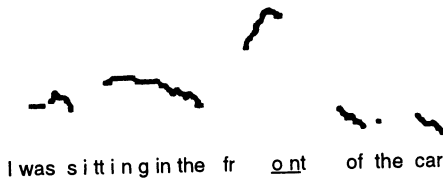


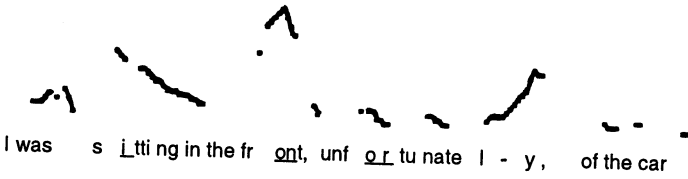
According to Couper-Kuhlen, the nucleus is 'the last stressed syllable with any kind of noticeable pitch modulation' (Couper-Kuhlen 1986:81). A Beckman & Pierrehumbert corollary states that 'there is a rule forbidding any accent after the nuclear accent in an intonation contour' (Beckman and Pierrehumbert 1986:266). This accounts for why the accent on 'ma-' cannot be a nucleus. With the sentence-medial structure included, the description shows the DIC interrupted early in the head:



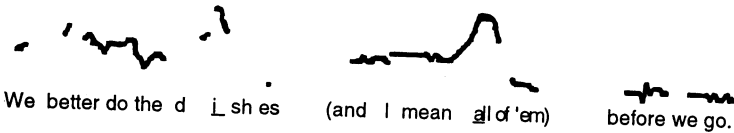
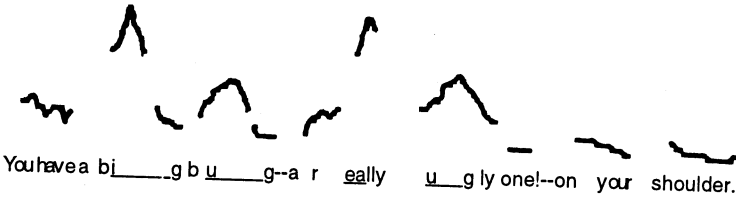
The resulting IC structure shows a nucleus in the second and third IPs but not in the first. It would be gratuitous to posit nucleus status to 'ma-' in the first utterance merely because an IP boundary is 'required'. Since by definition all ICs have a single nucleus, the presence of DICs reveals the importance of accounting for the fact that prosodic units which are supposedly equal in quantity (i.e., IPs) are associated with ICs that differ significantly in quantity--that is, one having a nucleus and one not.

DIC segments reveal not only a difference in IC quantity as regards the presence or absence of a nucleus but even as regards the presence of a pitch accent itself. It is altogether possible for one segment of a DIC to have no pitch accent at all:



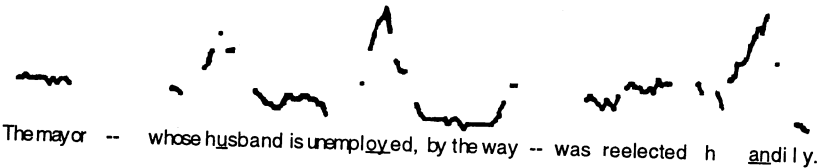


In the second sentence, the tail--consisting of all unaccented syllables following the nucleus--is separated from the nucleus. To identify the third string, in which no pitch accent is present, as a separate IC is highly suspect and runs counter to both the nucleus-based and pitch-accent based systems of IC description. Other examples can be shown in which segments of DICs contain no pitch accent. In these two examples, as in the previous one, the string containing no pitch accent is that following the medial structure:

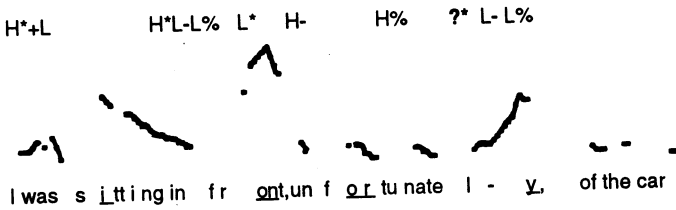


However, it is also possible for the relevant string to be the first in the sentence, as, for example in this case, in which no pitch accent is associated with 'ma-' due to the fact that 'mayor' is old information.

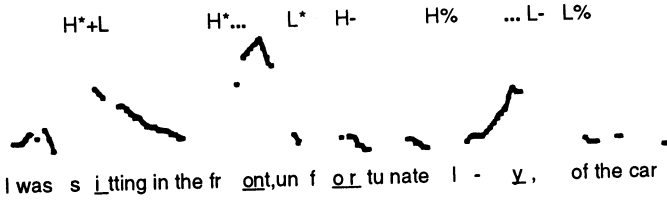
'How did the mayor with that rich salesman husband of hers do in the election yesterday?'



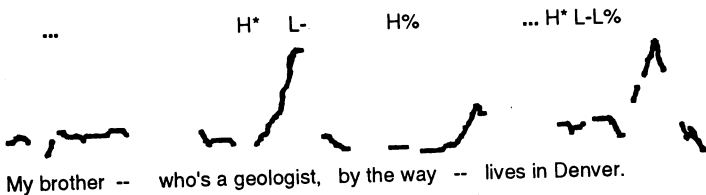
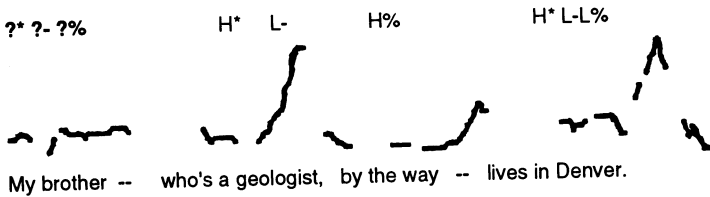
The existence of DICs calls for a change in the way ICs are represented. In this example, for instance, the positing of a phrase accent and a boundary tone located at the word 'front' suggests the termination of a complete IC, which is not the case.



Instead, a DIC, including the tonal material associated with 'of the car', is in evidence, and the only actual phrase accent and boundary tone are located at the very end of the sentence. The use of ellipses indicates the discontinuity and allows for a clear representation of all and only the actual tonal components of the interrupted contour:



Ellipses can also represent the complete absence of salient tonal material in a DIC segment, as in the following sentence in which 'my brother' is given:



Recursively embedded DICs could include double ellipses in their representations:



- Gussenhoven, C. 1988. Intonational phrasing and the prosodic hierarchy. *Phonologica* 1988, ed. by W. Dressler, H. Luschützky, O. Pfeiffer, and J. Rennison. London: Cambridge University Press.
- Gussenhoven, C. 1990. Tonal association domains and the prosodic hierarchy in English. *Studies in the pronunciation of English: a commemorative volume in honour of A. C. Gimson*, ed. by S. Ramsaran. London: Routledge.
- Gussenhoven, C., and A. Rietveld. 1992. Intonation contours, prosodic structure, and pre-boundary lengthening. *Journal of phonetics* 20.283-303.
- Hayes, B., and A. Lahiri. 1991. Bengali intonational phonology. *Natural language and linguistic theory* 9.
- Ladd, D. 1986. Intonational phrasing: the case for recursive prosodic structure. *Phonology* 3.311-340.
- Ladd, D. 1992. Compound prosodic domains. Paper distributed by Department of Linguistics, University of Edinburgh.
- Nespor, M., and I. Vogel. 1982. Prosodic domains of external sandhi rules. *The structure of phonological representations*, ed. by H. Vander Hulst and N. Smith. Dordrecht: Foris Publications.
- Nespor, M., and I. Vogel. 1986. *Prosodic phonology*. Dordrecht: Foris Publications.
- Pierrehumbert, J. 1980. *The phonology and phonetics of English intonation*. PhD dissertation. Massachusetts Institute of Technology.
- Pierrehumbert, J., and M. Beckman. 1988. *Japanese tone structure*. Cambridge, MA: The MIT Press.
- Pierrehumbert, J., and J. Hirschberg. 1990. The meaning of intonational contours in the interpretation of discourse. *Intentions in communication*, ed. by P. Cohen, J. Morgan, and M. Pollack. Cambridge, MA: MIT Press.
- Selkirk, E. 1978. On prosodic structure and its relation to syntactic structure. *Nordic prosody II*, ed. by T. Fretheim, 111-140. Trondheim: TAPIR.
- Selkirk, E. 1980a. Prosodic domains in phonology: Sanskrit revisited. *Juncture*, ed. by M. Aronoff and M.-L. Kean. Saratoga, CA: Anma Libri.
- Selkirk, E. 1980b. The role of prosodic categories in English word stress. *Linguistic inquiry* 11.563-605.
- Selkirk, E. 1981. On the nature of phonological representation. *The cognitive representation of speech*, ed. by J. Anderson, J. Laver, and T. Meyers. Amsterdam: North Holland.
- Selkirk, E. 1984. *Phonology and syntax: the relation between sound and structure*. Cambridge, MA: MIT Press.
- Selkirk, E. 1986. On derived domains in sentence phonology. *Phonology* 3.371-405.