

Intonation, Stress and Meaning

Author(s): Elisabeth O. Selkirk

Proceedings of the Eleventh Annual Meeting of the Berkeley Linguistics Society (1985), pp. 491-504

Please see “How to cite” in the online sidebar for full citation information.

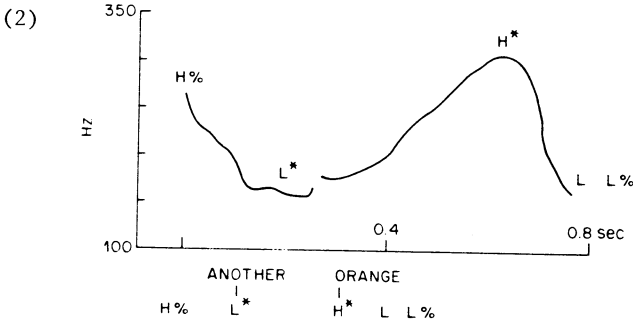
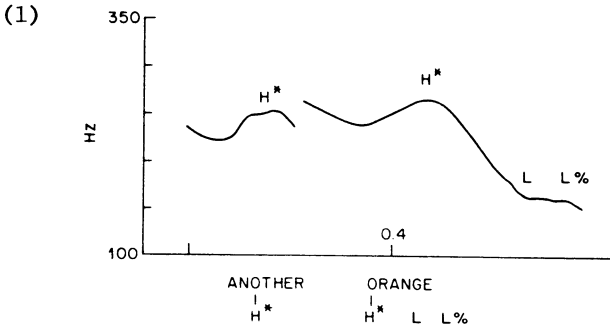
Please contact BLS regarding any further use of this work. BLS retains copyright for both print and screen forms of the publication. BLS may be contacted via <http://linguistics.berkeley.edu/bls/>.

The Annual Proceedings of the Berkeley Linguistics Society is published online via [eLanguage](#), the Linguistic Society of America's digital publishing platform.

Intonation, Stress and Meaning
 Elisabeth O. Selkirk
 University of Massachusetts/Amherst

1.0 This is a paper about sentence prosody in English: about the intonation of a sentence and its rhythmic stress pattern and about the relation between these two, and about the ties of sentence prosody to semantics and pragmatics. It sketches a development of the theory laid out in Selkirk (1984) according to which the representation of intonation forms part of surface structure, and mediates between stress on the one hand and meaning on the other.

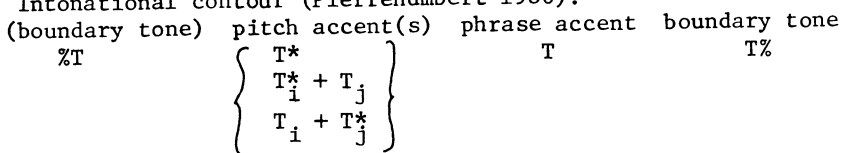
In speaking of intonation, I am drawing in particular on the work of Pierrehumbert (1980) and more recent work of Pierrehumbert and Liberman (1984), who have made great strides towards characterizing possible intonation contours of English. Consider the pictures in (1) and (2), from Pierrehumbert (1980).



F_0 contours like these we will take to be the phonetic transcription of the intonational contour. The theory of Pierrehumbert and Liberman includes both a phonological analysis of these contours and an explicit theory of phonetic implementation of this phonological representation by rules which give as their output the F_0 contour. Pierrehumbert

assumes with others that a sentence, or utterance, may be partitioned into one or more intonational phrases, and that each intonational phrase has a characteristic intonational contour. For Pierrehumbert the phonological representation of each intonational contour consists of a sequence of tonal entities of various formally distinct sorts, shown in (3): an initial (optional) boundary tone, a sequence of one or more pitch accents, a phrase accent and a final boundary tone.

(3) Intonational contour (Pierrehumbert 1980):

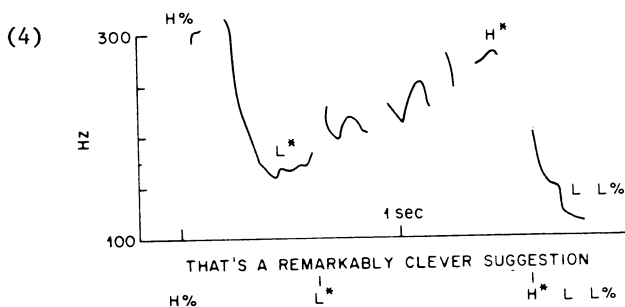


(T = H, L)

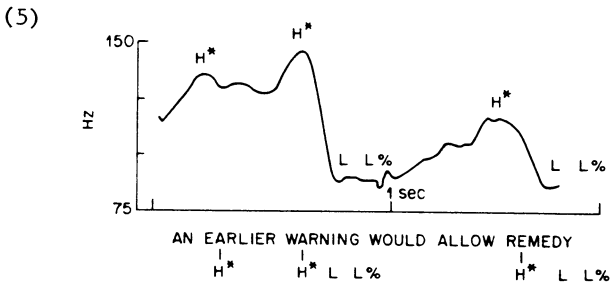
We can illustrate this with the contours in (1) and (2). The first, a typical declarative contour, consists of a sequence of H* pitch accents, a L phrase accent and a L% boundary tone. The H* pitch accents are on another and orange. Pitch accents are in general located on, i.e. (autosegmentally) associated with, the main stressed syllables of the words they are assigned to. As for the boundary tones of Pierrehumbert's theory, they are always associated with the first or last syllable of the intonational phrase. Here, there is a final L%. It, together with the preceding L phrase accent is responsible for the fact that in this sentence, there is a drop to the bottom of the speaker's pitch range. And, finally, in Pierrehumbert's theory the phrase accent has no particular association; it simply "floats" between the final boundary tone and the last pitch accent. In (1b) we have a quasi-phonological representation with association lines drawn in.

Look next at the intonational contour in (2). There is the same choice of phrase accent and boundary tone. There is also the same number of pitch accents, with the same location in the sentence. But there is a different choice of pitch accents on the first word--this time it is a L*. And in addition there is an initial boundary tone H%. Presumably there are corresponding differences in the meaning of the sentence.

Finally, compare (4), which has the same tonal contour as (2), but a different text. In this sentence only two of the words bear pitch accents.



I'm going to use the term pitch accent assignment for the representation of which words in the sentence bear a pitch accent (regardless of the tonal composition of the pitch accents). We could write this pitch accent assignment with capital letters, and will do so below. From the point of view of pitch accent assignment, then, the phrases in (1) and (2) are identical. This talk concerns only this aspect of the intonational structure of the sentence. We'll be looking at the relevance of pitch accent assignment for the phonological and semantic interpretation of the sentence. Other aspects of the intonational structure, including the choice of tones (what differentiates (1) from (2)) and phrasing (such as we see, for example, in (5)) will not be treated here.



It is an old idea that the constituents of a sentence are in effect marked by sentence prosody with respect to their status in a discourse. Let us consider the particular case of noun phrases. Suppose that it were true that the presence or absence of an intonational pitch accent on an NP were systematically correlated with discourse-related properties of the NP, for example, with whether the NP were a new or old referent in the discourse. This being so one might be tempted to view pitch accents as morphemes, quite comparable in kind to morphemes indicating (in)definiteness, for example. On this view, pitch accents would be elements of a surface syntactic structure, freely assigned there, and submitted to a semantic/pragmatic interpretation on the one hand and a phonological interpretation on the other.

Now suppose furthermore that it were true that the presence of a pitch accent on a syllable determined the presence of a phrasal rhythmic stress prominence, and not vice versa. (Note that this is easy to grasp conceptually if pitch accents are elements of a surface structure).

In this talk I want to give some reasons for believing these two propositions about the semantic and phonological interpretation of pitch accents to be true. If they are true, then sentence stress patterns (involving NP's, and presumably other constituents as well) would be largely a reflection of the status of the sentence and its parts in a discourse. The pitch accents will have been freely assigned to words in the sentence, and the sentence interpreted for its consequence appropriateness in discourse. And the pitch accents would determine the location of local rhythmic prominences. So the place for syntax-dependent stress rules in the sentence, like the

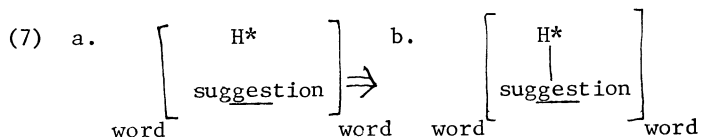
Nuclear Stress Rule (and perhaps even the Compound Rule), would be relatively small in prose spoken or read in normal discourse circumstances.

2.0 My basic proposal, then, is that English pitch accents are affixes, freely assigned to constituents of size word, or smaller, in surface structure.¹ And now I want to show three things. First, that the consequent relation (of autosegmental association) between a pitch accent and the main stress of a word can be seen as one of the perfectly banal sort already known in phonology. Second, that a straightforward treatment of the semantics and pragmatics of pitch accenting is at least possible. Third, that a quite elegant account of the pitch accent/phrase stress relation is permitted. Due to the limitations of time, I will not be able to contrast this "pitch accent first" theory with other theories of the pitch accent/phrase stress relation in the generative tradition, but simply point out here that seeing intonation as prior represents a radical departure from the line pursued by Chomsky 1971, Jackendoff 1972, Liberman 1975, and Pierrehumbert 1980, though it is a line that was in fact suggested to me originally in a remark by Pierrehumbert.

2.1 Let us first consider the word stress/pitch accent relation. There is a well known generalization, expressed in (6):

(6) A pitch accent is realized on the main stress of a word.²

This generalization is illustrated in (1), (2), (4) and (5) where the pitch accent (the "starred" tone) is associated with the main stress of another, orange, remarkably, suggestion and so on. The task at hand is simply to give an account of how a representation like (7a), which is the output of the assignment of a H* pitch accent to a word by the morphology, is converted to (7b) where the accent is associated to the main stress of suggestion. Note that in (7a) we simply have a simultaneous representation of the floating tonal morpheme, the H*, and the segmental material corresponding to the complex form suggestion both within the domain of a word.³



The mapping of (7a) into (7b) is a trivial matter. Whatever device guarantees the association of starred tone to text in normal pitch accent languages is available here for English. In Swedish, for example, the pitch accents found on every word are tropic to the main stress of the word (Bruce 1977). The only difference between English and Swedish in this connection is that in Swedish every word has a pitch accent, and so the presence of pitch accent can have no distinctive semantic interpretation, while in English the presence or absence of pitch accent is a free choice, and therefore interpretable. But as far as the alignment of pitch accent with the main stress in the word goes, English works like any pitch accent language. (This

indeed was more or less Goldsmith's (1977) point in his early article on an autosegmental approach to English intonation.)⁴ Which is to say that, given our hypothesis that in English pitch accents are ("floating") morphemes assigned to words, nothing additional or English-particular needs to be said about the generalization expressed in (6).

2.2 Not all words bear pitch accent in English, and a task on which I am currently embarked is to figure out what the presence or absence of pitch accent means. I am adopting the general point of view shared certainly in the British tradition (cf. Halliday 1967, Allerton 1978) and in the American in particular by Bolinger that the presence or absence of pitch accents is crucial in characterizing the appropriateness of a sentence in a particular discourse.

For the present, I want to artificially confine the problem to the interpretation of the presence or absence of pitch accents on noun phrases. I think this will illustrate the general point that I wish to make, which is that

- (8) Each constituent of the sentence is evaluated individually for its status with respect to the discourse on the basis of the presence or absence of pitch accent(s).

This is another way of saying that

- (9) There are no phonological principles (syntax-based or otherwise) which govern the distribution of pitch accents in the sentence, and in particular there is no such thing as "deaccenting."⁵

The first aspect of the meaning of accent with respect to noun phrases may be illustrated by the two sentences (11a) and (11b), both of which are possible responses to the question in (10).

(10) What did she do?

- (11) a. She {rejected} their SOLUTION
 REJECTED
 b. She REJECTED their solution

In (11a) SOLUTION is pitch accented and this coincides with a possible interpretation of SOLUTION as a new referent in the discourse, whereas in (11b) the absence of pitch accent on solution requires us to presuppose that their solution, or solutions in general, already form part of the stock of entities at issue in the current discourse. Please ignore the pitch accents on the verb, which will not be discussed at the moment. Plenty of similar examples involving NP's have been discussed in the literature often under the rubric of "deaccenting", a misleading term. Consider for instance the examples in (12) from Ladd (1980), similar examples in (13) observed by myself, and the examples in (14) from Allerton (1978).

In each of these instances, the lack of a pitch accent on the underlined noun phrase (often accompanied by the presence of a so-called "default" pitch accent on a nearby constituent) is required if the NP is to be interpreted, as intended, as coreferent to, or as second mention of, an NP earlier mentioned.

- (12) a. A bill was sent to Congress today by President Carter which would require peanut butter sandwiches to be served at all government functions. At a press conference today, a group of Senators led by Republican Barry Goldwater of Arizona DENOUNCED the measure (*denounced the MEASURE⁶).
- b. I can't imagine what it would be like to be a dentist but I'm awfully glad there are guys who want to BE dentists (*be DENTISTS).
- (13) a. For them, it is WITH metrical trees that patterns of prominence must be represented.
- b. Some expressed concern that the President wouldn't be able to get a budget resolution THROUGH Congress.
- c. I didn't even know it was BY Beethoven.
- (14) a. Why don't you sit on our settee?
By the way, where did you BUY the sofa? (*buy the SOFA)
- b. John's bought some new shelves for his books. The books are very valuable of course. He bought some himself, but he was given a lot by his uncle. Anyway, I don't think MUCH of the shelves. (*much of the SHELVES)

Note that in all these cases, the NP lacking an accent follows the last (nuclear) pitch accent in the sentence. In such circumstances, the lack of accent is especially easy to hear. But earlier in the sentence, i.e. preceding the nucleus, the presence or absence of pitch accent appears to have exactly the same function. So, for example, the sentences (15) have systematically different possibilities for appropriateness in discourse depending on the old/new status of the NPs.

- (15) a. THEN JANE sent her MANUSCRIPT to the PUBLISHER
b. THEN Jane sent her MANUSCRIPT to the PUBLISHER
c. THEN Jane sent her manuscript to the PUBLISHER

The important thing here is that the presence or absence of the pitch accent on each NP is assessed in the interpretation of the sentence.⁷ In that sense, pitch accent is functioning somewhat like indefinite or definite morphemes. The examples discussed appear to support the following generalizations about the meaning of pitch accent:

- (16) The absence of a pitch accent on an NP indicates it is an old referent in the discourse.

- (17) The presence of a pitch accent on an NP may indicate its status as a new referent.

(I am using the term referent in the Heim (1982) and Kamp (1981) sense of discourse referent.)

The examples examined so far have only centered around the new/given status of an NP, as marked by pitch accents. But, as is well known, there is more to the meaning of pitch accents. There are at least two additional generalizations. The first goes, roughly speaking, back to Jackendoff (1972):

- (18) A pitch accent on an NP may indicate the NP is a FOCUS in a FOCUS-"Presupposition" structure (even if the NP is "old").
e.g. Jane sent her manuscript to the PUBLISHER (not to the BOOK REVIEW EDITOR)

The second generalization I advance tentatively on the basis of work of Bardovi-Harlig (1983a,b) and others:

- (19) A pitch accent on an NP may indicate that it is a TOPIC in a TOPIC-comment structure (even if the NP is "old").
e.g. What do you think of our new teacher?
Oh, MR. JONES is all RIGHT.
Oh, MR. JONES we LIKE.

(I'm assuming that the TOPIC occupies sentence-initial position.)

Together generalizations (17-19) might be thought of as falling together under the broader generalization (20).

- (20) The presence of a pitch accent on an NP implies a change in the status of that NP (i.e. its corresponding "referent") in a representation of discourse.

While (16) amounts simply to saying that

- (21) The absence of a pitch accent on an NP implies no change in the discourse status of that NP.

We can give straightforward expression to these semantic-pragmatic generalizations within the standard T-model of grammar of Chomsky and Lasnik (1977) if pitch accents are affixes in S-structure.

The basic empirical claim, then, is that the distribution of pitch accents in surface structure is "free", subject to appropriateness with respect to semantics/pragmatics, and that there are no phonological principles determining which word will bear a pitch accent.

2.3 Let us turn now to the question of the relation between phrasal rhythmic structure (phrase stress) and pitch accents. There is a first generalization about this relation which is assumed in the work of Liberman, Pierrehumbert and myself, for example:

where α is a Phrase or S

Conditions: (a) x_i is first and last on its level

(b) x_j is on metrical level three or higher

Operating on a cyclic domain α (a Phrase or S), it picks out the beat x_i in the rightmost immediate constituent β that is (i) most prominent within β (only a most prominent beat could be alone on its own metrical level in β) and (ii) on at least the third metrical (word) level, and it adds positions to the grid in alignment with x_i , of which x_j is the topmost. (A general condition ensures that the highest grid position introduced will be greater than any other in the domain α , and that such a position will be only minimally greater than the others, cf. Selkirk 1984.)

To illustrate how the NSR functions together with the Pitch Accent Rule, let us do one derivation of a phrase stress pattern; the one in (30).

(30) [[Sophie's friend] [had [studied [modal logic]]]]

word stress	x	x	x	x	x
NP cycle	x	x_{par}		x	x_{nsr}
VP cycle:			x_{par}	x	x
S cycle:	x	x_{par}	x_{nsr}	x	x_{par}

The pattern is derived cyclically (for arguments in favor of the sentential cycle, see Selkirk (1984)), and in many respects is reminiscent of a standard, SPE, derivation. Words (excluding function words) come into the sentence with word stress. On the two noun phrases, rightward prominence is produced, but for different reasons in each case. Friend is pitch-accented, and so receives greater prominence by the PAR, while logic is more prominent simply because rightmost, through the NSR. The grid positions assigned are subscripted with the initials of the rule that is the source. On the VP cycle, the PAR gives a lefthand prominence on the pitch-accented verb, here in effect overriding the potential effect of the NSR. And, finally, on the S cycle, the NSR will assign greatest prominence to the verb, which here bears the greatest prominence contained within the VP (cf. the formulation in (29)). (As for the PAR, it has a role, too, this time ensuring greater prominence of the pitch-accented friend over the non-pitch-accented logic.) Note that it is,

crucially, a combination, or collaboration, of the NSR and the PAR which gives greatest rhythmic prominence in the sentence to the non-final element studied. The PAR elevates both studied and friend to higher prominence, and the NSR picks the rightmost among them for greater prominence.

In a straightforward way, then, the pitch accent-first theory with the collaboration of these two rules gives automatically the result that "the last pitch accent is most prominent (bears the "nuclear stress"), or, put another way, that "there is no pitch accent after the nucleus", generalization (26). (In Pierrehumbert (1980), where a stress-first theory was assumed, and the pitch accents were mapped onto the sentence in function of the phrase stress pattern independently derived, this generalization had to be stipulated.)

To sum up, the theory laid out in this paper, according to which intonational structure (tonal contour, phrasing and pitch accent assignment) is part of surface structure and then interpreted in both the semantic and the phonological dimensions achieves a certain success. It holds promise of an approach to the semantics of intonation which makes the discourse-related issues tractable in rather conventional terms. And in the area of phonology, the intonation-stress relation is given an absolutely bland, but simple and completely accurate treatment with a bare minimum of machinery. It seems that by giving intonation a central place in the grammar, solutions of a surprising conceptual simplicity can be found to a variety of puzzles and problems which resisted analysis when intonation was thought of as somehow belonging simply to the phonology of a sentence.

FOOTNOTES

¹Pitch accents are here being treated as any other morpheme. They have their own "syntax", which is a specification of the sort of syntactic object they "attach" to. The claim that they are assigned to constituents of size word (or smaller) and not to larger, phrasal constituents, is supported by facts concerning their (auto-segmental) association to particular syllables: on domains within the word, pitch accents associate to the most prominent syllable within the domain, where prominence is determined by the regular rules of word stress, whereas on the sentence (in phrases) it is (prior) placement of pitch accents that determines stress pattern, and not vice versa, cf. below.

²Unless, of course, subparts of a word are themselves being contrasted, as in DIvest vs. INvest. Here the pitch accents are assigned to the individual syllables/prefixes, and associated to the principal (and only) prominence within that domain. The only possible interpretation here is of a mini-Focus/"Presupposition" structure, the foci DI- and IN- being set against the "presupposition" x-vest.

³This sort of simultaneous representation of morphemes within some same domain is familiar from McCarthy's (1979, 1981) work on Semitic, as well as from African tonology, cf. Goldsmith (1976).

⁴In Goldsmithian terms, one would say for English and Swedish that a "star", *, is assigned to the main stressed syllable in the domain. Then the association of the tone bearing the * to the syllable in the text bearing the * proceeds by convention. In Japanese, another pitch accent language, the location of the "star" in the text has nothing to do with stress. It is only partially determined by rule, and in nouns, for example, it must form part of the lexical representation (Haraguchi (1977)).

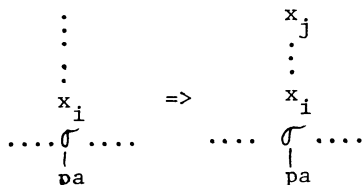
⁵The notion "deaccenting" implies that "normal stress" principles like the Nuclear Stress rule will always govern stress relations, at some (presumably early) point in the phonological derivation, and that, subsequent to the operation of the NSR, its effects may be undone, by "deaccenting", where discourse-related conditions seem to require this. Ladd 1980 subscribes to such a view. The model of grammar implied by such a view is one where, in effect, discourse conditions form part of the "structural description" of a phonological process like deaccenting; it is one therefore which recognizes no sentence grammar as distinct from "discourse grammar". I believe this line of thinking is not particularly revealing.

⁶To be precise, denounced the MEASURE is ungrammatical in this context, unless of course the MEASURE is "contrastively stressed". A similar remark obtains for other examples below.

⁷The point needs to be emphasized, lest it be thought that the pitch accenting of an NP is, instead, predictable from some other property of the sentence, e.g. the newness/oldness of a higher constituent containing it. The sentences in (15), for example, are all appropriate where the VP complex send x to y, x = manuscript, y = publisher is new in the discourse. The accenting of the NPs correlates with the oldness/newness of the NPs themselves. This is independent of the way in which the accenting of NPs may, in effect, license the interpretation of the higher constituent as old or new (via the Focus Rules, see Selkirk 1984, Chapter 5).

⁸For arguments in favor of the metrical grid as the representation of stress, see Liberman 1975, Prince 1983, Selkirk 1984.

In Selkirk 1984, the Pitch Accent Rule was stated in grid terms as follows (p. 276):



- Conditions: x_j is on a metrical grid level \underline{n} , where
- (i) \underline{n} is (minimally) greater than the level of any other beat not aligned with a pitch accent
 - (ii) $n \geq 4$

⁹It does seem, though, that greater care should be taken with such intuitions. Couldn't they be attributable instead to a) the fact that at the end of a phrase there is a rhythmic hiatus (evidenced in final lengthening and/or pausing, cf. works of Lehiste, Cooper, Klatt among others, and Selkirk 1984 Chapter (6) and b) the possibility that the pitch accent heard as more prominent is simply the one which precedes such a hiatus? To establish hypothesis (b) would require experimental investigation concerning the perception of prominence. The alternative NSR hypothesis would have it that some prominence effect independent of the phrase-final rhythmic hiatus is introduced and presumably realized in connection with the righthand prominent element in the domain. The analysis of actual production data in terms of (i) the derivational patterning around the putative NSR mainstressed syllable in the domain; (ii) degree of F₀ obstruction (modulo declination, etc.) of that syllable and (iii) its intensity should presumably bring relevant evidence to bear.

BIBLIOGRAPHY

- Allerton, K.H. (1978) The notion of givenness and its relation to presuppositions and to theme. Lingua 44, 133-168.
- Bardovi-Harlig, K. (1983a) A Pragmatic Approach to English Intonation. Unpublished Ph.D. dissertation, University of Chicago.
- Bardovi-Harlig, K. (1983b) On the claim that topics are not stressed. Papers from the Parasession on the Interplay of Phonology, Morphology, and Syntax, Chicago Linguistic Society.
- Bolinger, D. (1965) Forms of English: Accent, Morpheme, Order. Cambridge, Mass.: Harvard University Press.
- Bolinger, D. (1972) Accent is predictable (if you're a mind reader). Language 48, 633-644.
- Bruce, G. (1977) Swedish Word Accents in Sentence Perspective. Gleerup: Lund.
- Chomsky, N. (1971) Deep structure, surface structure and semantic interpretation. In D. Steinbert and L. Jakobovits, eds., Semantics: An Interdisciplinary Reader in Philosophy, Linguistics and Psychology, 183-216. Cambridge: Cambridge University Press. Reprinted in Chomsky 1972b.
- Chomsky, N. and H. Lasnik (1977) Filters and control. Linguistic Inquiry 8, 425-504.
- Cooper, W. and J. Paccia-Cooper (1980) Syntax and Speech. Cambridge, Mass.: Harvard University Press.

- Goldsmith, J. (1976) Autosegmental phonology. Doctoral dissertation, Massachusetts Institute of Technology. Available from Indiana University Linguistics Club, Bloomington.
- Goldsmith, J. (1977) English as a tone language. In D. Goywaerts, eds., Phonology in the 1980's; also in Communication and Cognition (1977).
- Halliday, M.A.K. (1967) Notes on transitivity and theme in English, Part II. Journal of Linguistics 3, 199-244.
- Haraguchi, S. (1977) The Tone Pattern of Japanese: An Autosegmental Theory of Tonology. Tokyo: Kaitakusha.
- Heim, Irene (1982) The Semantics of Definite and Indefinite Noun Phrases. Unpublished Ph.D. dissertation, University of Massachusetts/Amherst.
- Jackendoff, R. (1972) Semantic Interpretation in Generative Grammar. Cambridge, Mass.: The MIT Press.
- Kamp, H. (1981) A theory of truth and semantic representation. In J. Groenendijk, T.M.V. Janssen, and M. Stokhof (eds.) Truth Interpretation and Information.
- Ladd, D.R. (1980) The Structure of Intonational Meaning. Bloomington: Indiana University Press.
- Liberman, M. (1975) The intonational system of English. Doctoral dissertation, Massachusetts Institute of Technology.
- Liberman, M. and J. Pierrehumbert (1984) Intonational invariance under changes in pitch range and length. In M. Aronoff, R. Oehrle, B. Wilker, and F. Kelley, (eds.) Language Sound Structure. Cambridge, Mass.: The MIT Press.
- McCarthy, J. (1979) Formal problems in Semitic phonology and morphology. Doctoral dissertation, Massachusetts Institute of Technology.
- McCarthy, J. (1981) A prosodic theory of nonconcatenative morphology. Linguistic Inquiry 12, 373-418.
- Pierrehumbert, J. (1980) The phonology and phonetics of English intonation. Doctoral dissertation, Massachusetts Institute of Technology.
- Prince, A. (1983) Relating to the grid. Linguistic Inquiry 14, 19-100.
- Selkirk, E.O. (1984) Phonology and Syntax: The Relation between Sound and Structure. Cambridge, Mass.: The MIT Press.