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Johan 't Hart, René Collier, and Antonie Cohen: *A Perceptual Study of Intonation. An Experimental-Phonetic Approach to Speech Melody*. Cambridge: Cambridge University Press, 1990. xv + 212 pp. Hardcover £27.50, \$43.50.

At the Institute for Perception Research (IPO) in Eindhoven, a theory of intonation (that is, pitch variation) has been developed in the last three decades. In this book with the title *A Perceptual Study of Intonation* (henceforth PSI) the authors (henceforth HCC) want to give a comprehensive account of this approach — for the first time in one volume. In the future, PSI will thus be the standard reference to the IPO approach, as, for example, Pierrehumbert (1980) is to the tone-sequence approach.

HCC point out at the very beginning that they do not want to present a unified — linguistic and phonetic — theory of intonation; their "... approach can best be characterized as an experimental-phonetic study of how the listener's intonational knowledge is brought to bear on his perception and interpretation of spoken language" (p. 6). PSI is not intended to be a textbook or to present the state of the art of intonation in general but to present the state of the art of the IPO approach in particular; HCC do not refer systematically to competing theories.

The second chapter on "Phonetic aspects of intonation" (physiology, acoustics, and perception of intonation) is, for newcomers, a good and sufficiently detailed and complete overview, providing them with the necessary background, especially with "the limits of perceptibility of pitch phenomena in speech" (p. 25).

Chapter 3, "The IPO approach," presents the basic approach that concentrates on the perceptually relevant pitch movements and leaves aside microintonation phenomena, that is, intrinsic pitch and context effects, that do not contribute to the perceived pitch contour. The rather hilly and frayed original pitch contour is approximated via resynthesis by so-called "close copies" that are stylized with straight-line segments between the relevant turning points. Such a stylization is considered to be successful if in perception experiments no difference can be perceived between the resynthesized original and the stylized close copy. Although the stylization by straight lines is a characteristic feature of the IPO approach, it was chosen simply because it has the advantage of revealing "neatly segmented, discrete units" (p. 71). Other parametric stylizations can be imagined as well.

The next step is to give an "official status" (p. 55) to the various standardized movements, the so-called "pitch contours." The heuristics was the following: a tentative grammar containing several pitch contours was checked with fresh material; this grammar could account for 94% of the total number of contours. On page 65, a schematic survey of the method is given that should finally result in a grammar that contains an inventory of all possible pitch contours. This survey wants to illustrate "... the perceptual detour that is necessary to establish the link between the concrete  $F_0$  [that is, fundamental frequency] curves, on the one hand, and the abstract intonation patterns, on the other. Since only the latter are relevant to communication, and since the former constitute the only attribute of intonation that can be measured, such a link is indispensable in the analysis" (p. 66). In concluding this chapter, the IPO approach is characterized in general terms: key words are "experimental-phonetic, bottom-up approach [and] the centre of gravity ... in perception" (p. 66).

The LPC resynthesis used at IPO is good but not excellent and can thus clearly be distinguished from the original (p. 46). It remains to be proven that with a better resynthesis, the same perceptual equivalence can be achieved. Note that the domain of investigation — the window size, so to speak — is the utterance, not words or syllables. Especially with a smaller window size and a better resynthesis, microintonation might really be perceived, even by a naive listener, not "only in direct pair-comparison and only by trained listeners" (p. 48). But HCC are surely right if they stress that microintonation is not relevant for the perception of the overall pitch contour — although it might be relevant for the perception of segmental or speaker-specific information.

Perceptual equivalence as the only criterion is, at the same time, a clear advantage but also a limitation: on the one hand, it can be verified empirically and thus, vice versa, subjected to falsification. Such an empirical

verification may not be impossible for intonational theories that are more abstract, such as, for example, the tone-sequence approach, but in these theories it is not built in as a necessary step; other criteria, like universality, simplicity, or generality, are often considered to be more important. On the other hand, perceptual equivalence alone is deprived of all communicative function and can thus not be the “ultimate” criterion for, for example, functional equivalence, but only a — manageable — operationalization. HCC are aware of this limitation (p. 175).

In chapter 4, a “theory of intonation” is given in the form of ten propositions that mainly address the perceptual organization of pitch contours and the relation of intonation to accentuation, syntax, and meaning. (It might be no accident that the title of this chapter could — after Bloomfield [1926] — just as well have been “A set of postulates for the science of intonation.”) With the first set of propositions, HCC stress their point that there is a finite number of basic intonation patterns that consist of pitch movements, not of (holistic) tunes or of levels. With the second set of propositions, they stress the mutual independence of intonation on the one hand, and of accentuation, syntax, and meaning on the other hand. HCC conclude this chapter with a general characteristic of their theory that is, at the same time, an outline of its origin:

At the outset of our investigations, in the early sixties, we were faced with ... observational and descriptive problems. ... As a consequence, the resulting theory ... has a strong experimental-phonetic inclination. ... Our theory is based on a *bottom-up* approach. ... Abstract properties are thus not posited on a *priori* phonological considerations. The same is true of the *functional* properties of intonation (p. 119f.).

HCC classify their theory among “*contour-interaction*” models, not among “*tone-sequence*” models (p. 120); see Ladd (1983).

One of the controversial propositions with regard to the theoretical discussion is the third: “There are no pitch ‘levels’” (p. 75), because this proposition explicitly attacks another, predominant, theory of intonation, the tone-sequence approach (Pierrehumbert 1980). From a perceptual point of view, there might be some arguments in favor of levels instead of contours; see for example Liberman and Pierrehumbert (1984) and Verhoeven (1987). Yet, in my opinion, neither the pros nor the cons are fully convincing. The matter might be as simple as the fact that language does not care about redundancy (but phonologists do), and it might therefore not be adequate to decide strictly in favor of levels or movements and nothing in between (see, for an attempt to disentangle the relevancy of pitch level and pitch movement, House 1991). But alas, it seems as if theories have to be concise and cannot do with two seemingly competing

units at the same time. Movements and levels might be the same as figure and ground in visual perception: they are dependent on each other. After all, a peak is a peak only because it is surrounded by ups and downs, and movements necessarily entail turning points.

One shortcoming of a purely intonational approach should be mentioned: I fully agree with HCC when they point out that "The correspondence between intonation and syntax is neither obligatory nor unique" (p. 100) and that "Intonation features have no intrinsic meaning" (p. 110). The problem is that they confine intonation and thereby their object of investigation to pitch. They mention that syntactic "ambiguities may be resolved by prosodic means other than intonational" (p. 108). From a functional, communicative point of view it would be more adequate to look at all the prosodic features at the same time: the human speaker/listener certainly does not tell apart a certain rise-fall pitch movement (or a High-Low sequence) from a greater duration and/or intensity on the same words in normal communication, but unifies these perceptual events and perceives these words, for example, as stressed. (Of course, subjects can, in an experimental setting, be prompted to focus on single dimensions such as pitch, but this is not "real life.") In such a "unified" prosodic approach, the correspondence between suprasegmentals and syntax/semantics would be closer — but never obligatory nor unique, for sure. Note that this holds for almost every linguistic feature at any level of analysis: let us take verb order, which is, in many languages, a genuine syntactic means to denote sentence mood; yet it is sometimes not sufficient because it is neutralized. Nobody would claim that verb order is therefore not relevant for syntax. The same holds for the "distinctive" features on the segmental level in phonology if we try to find them in phonetics: it is a commonplace that phonologically voiced segments are often phonetically voiceless and vice versa. If we compare these facts with a "standard" intonational feature in syntax/semantics, namely rising terminal pitch denoting questions, quite a lot of questions do not have rising terminal pitch, and not every rising terminal pitch denotes a question. This does not mean, however, that this feature could be expelled from the domain of syntax/semantics. (As for some critical remarks on the experimental evidence put forward in Geluykens [1987], quoted by HCC on p. 113, see Batliner and Oppenrieder 1988.)

Chapter 5 is on declination, that is, on "the observed tendency of *F*<sub>0</sub> to decrease slowly from beginning to end of an utterance" (p. 121). Here again, HCC's empirical orientation is evident: "... declination was not only a convenient construct enabling the investigator to better interpret an *F*<sub>0</sub> recording, but also a perceptually relevant attribute: It simply sounded more natural whenever declination was added [to resynthesized

utterances]" (p. 123). HCC address several questions relevant for the concept of declination, such as topline vs. baseline, slope of the declination, declination reset in longer utterances, and the communicative, perceptual, and physiological aspects. Even if PSI is not intended to give the state of the art in general, HCC could have mentioned some problems connected with declination: for example, first, whether it really is a global and general phenomenon (Does it occur that often in spontaneous speech? How can we model declination for utterances with a rising contour? etc.) and second, whether their empirical approach toward declination is the only imaginable one; see for example the rather lively discussion in JASA between Lieberman et al. (1985), t'Hart (1986), and Lieberman (1986). (In PSI, these titles are not given in the references.)

The problem with declination is that for some restricted and experimental data, it is *prima facie* very obvious, but at a close look, it is, even for such data, very intricate at the same time; see Terken (1991: 1776): "... it appears that the topline and the baseline can vary more or less independently, but that the slope of the baseline affects expectations about the slope of the topline." In addition to that, it is still not settled whether declination is a phenomenon on its own, or rather an epiphenomenon of, for example, downstepping or other local and/or perceptual factors; for an "integrated account of declination," see Hauser and Fowler (1992: 364).

In chapter 6 on "Linguistic generalizations," HCC give a phonological account, a "systematic phonetic treatment" (p. 152), of Dutch intonation. They introduce such intonational features as RISE, FALL, EARLY/LATE (in the syllable), etc., and give a catalogue of possible contour configurations as well as rules for basic forms of a contour and for tune and text association. In the following, they deal with Ladd's (1983: 721) critical remarks ("inability to express many phonological and functional generalizations [and] excessive concern with ... perceptual and acoustic details") and contrast them with their own view that, basically, the phonologists could be right, but that in Ladd's approach, "... the reduction of perceptually distinct pitch movements to just two abstract pitch targets undermines the identity of the intonation patterns" (p. 168).

Chapter 7 is on existing and potential applications. Existing applications are the acquisition of intonation in foreign language teaching, an intonational electrolarynx to be used as an aid for handicapped people (these two are in a pilot stage), and applications in linguistic and phonetic research. HCC are rather sceptical when it comes to a potential application in automatic speech recognition, because a necessary prerequisite for such an application is, in their opinion, an automatic stylization and the

detection of "... a boundary marker that takes the form of a declination reset" (p. 182); at the present stage, stylization is not fully automatic.

The pivot point might really be the separation of the continuous stream of speech into chunks — intonational phrases — because each existing intonational theory needs this information for analysis, but there are alternatives to a full IPO stylization as prerequisite: another sort of data reduction could be used; see for example Fujisaki (1987); or just a straight-forward procedure, as in Huber (1988: 74ff), namely the computation of regression lines. It is an empirical question which sort of stylization is the best one for the detection of boundary markers.

In their last chapter, "Conclusion," HCC again address the main topics of PSI and summarize the main problems in intonation research and their treatment in the IPO approach.

In conclusion, PSI is an impressive account of the IPO approach and of all the intonational topics that are dealt with thoroughly in this approach. The book is clearly written, and the theoretical positions held by HCC are always explained and traced back to their origin. Such a methodological orientation might look old-fashioned in view of predominant theoretical approaches elsewhere that still go back to the abandonment of methods like, for example, pure distributionalism/taxonomics in favor of "real" theories, but it is sound heuristics. Naturally, the positions of PSI are therefore not those of the whole prosodic community, and the IPO approach has been criticized because it does not take into account phonological criteria. I myself sympathize with this perceptual-experimental approach that constitutes one of the few intonational models that is developed with and checked against a large data base from the very beginning. Such an approach guarantees that there is enough phonetic substance in the resulting model, and that the intuitions of the researcher are counterbalanced by empirical facts that have to be taken into account. PSI covers some very important aspects of intonation, and nobody can neglect the reported results as far as, for example, perceptual relevance and irrelevance are concerned. Yet, there are still points where I possibly would favor another view, and where the "frozen" genesis of this approach might be a hindrance.

HCC do not present the "ultimate" theory of intonation — and do not want to, as already mentioned in the beginning. This should not be considered a drawback, on the contrary: such a theory does not exist elsewhere — it is the Holy Grail of phonology, but so far Sir Lancelot has failed to find it.

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Nanette Twine: *Language and the Modern State. The Reform of Written Japanese*. London and New York: Routledge, 1991. 329 pp. £40.00.

The standardization and nationwide spread of the modern European national languages preceded or coincided with Europe's ascent to world dominance. A standardized written language that closely resembles the style of colloquial speech is, therefore, often seen as a prerequisite of modernization. When Japan opened its doors to Western enterprise in the 1850s, its linguistic situation was characterized by both the lack of a