Research Surveys in Linguistics

The Phonology of Tone and Intonation

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The Phonology of Tone and Intonation

Tone and Intonation are two types of pitch variation, which are used by speakers of many languages in order to give shape to utterances. More specifically, tone encodes morphemes, and intonation gives utterances a further discoursal meaning that is independent of the meanings of the words themselves. In this comprehensive survey, Carlos Gussenhoven provides an up-to-date overview of research into tone and intonation, discussing why speakers vary their pitch, what pitch variations mean, and how they are integrated into our grammars. He also explains why intonation in part appears to be universally understood, while at other times it is language-specific and can lead to misunderstandings.

The first eight chapters concern general topics: phonetic aspects of pitch modulation; typological notions (stress, accent, tone, and intonation); the distinction between phonetic implementation and phonological representation; the paralinguistic meaning of pitch variation; the phonology and phonetics of downtrends; developments from the Pierrehumbert–Beckman model; and tone and intonation in Optimality Theory. In chapters 9–15, the book's central arguments are illustrated with comprehensive phonological descriptions – partly in OT – of the tonal and intonational systems of six languages, including Japanese, French, and English.

Accompanying sound files can be found on the author's web site:
http://www.let.kun.nl/pti

Carlos Gussenhoven is Professor and Chair of General and Experimental Phonology at the University of Nijmegen. He has previously published *On the Grammar and Semantics of Sentence Accents* (1994), *English Pronunciation for Student Teachers* (co-authored with A. Broeders, 1997), and *Understanding Phonology* (co-authored with Haike Jacobs, 1998).

Research Surveys in Linguistics

In large domains of theoretical and empirical linguistics, scholarly communication needs are directly comparable to those in analytical and natural sciences. Conspicuously lacking in the inventory publications for linguists, compared to those in the sciences, are concise, single-authored, non-textbook reviews of rapidly evolving areas of inquiry. Research Surveys in Linguistics is intended to fill this gap. It consists of well-indexed volumes that survey topics of significant theoretical interest on which there has been a proliferation of research in the last two decades. The goal is to provide an efficient overview and entry into the primary literature for linguists – both advanced students and researchers – who wish to move into, or stay literate in, the areas covered. Series authors are recognized authorities on the subject-matter as well as clear, highly organized writers. Each book offers the reader relatively tight structuring in sections and subsections and a detailed index for ease of orientation.

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Voor Karel en Otto

Preface

The question of how the delicate pitch variations that humans can produce are employed in language has been one of the most fascinating topics in phonological and phonetic research at least since Joshua Steele's *Essay towards establishing the Melody and Measure of Speech* (Steele 1775), but has developed a particularly fruitful momentum in the past two decades. This book is an account of my current understanding of this issue.

Lexical pitch variations and intonational pitch variations are phonologically represented as tones, like H(igh) and L(ow), which form a string of elements running parallel to the string of vowels and consonants. Like vowels and consonants, tones may delete, assimilate, or change their value in particular contexts. They are organized temporally with reference to prosodic constituents, such as the mora, the phonological phrase, and the intonational phrase. Studying the phonology of tone and intonation can sharpen one's understanding of phonetics and phonology in a relatively brief time. The greater variation in the realization of tones, together with their relative sparsity compared with the denser occurrence of vowels and consonants, encourages a comprehensive view of the trajectory from underlying representation to phonetic surface form. As a result, the difference between phonology and phonetics as well as that between underlying phonology and surface phonology can more readily be appreciated.

The theory of intonational structure presented in this book owes a great deal to the work of Janet Pierrehumbert, whose 1980 thesis on American English intonation in effect provided the theoretical framework it has adopted, which work itself was intellectually indebted to Gösta Bruce's 1976 thesis on Stockholm Swedish. I was 'around' at the time Janet Pierrehumbert's thesis came out, but it took me a while to realize that its greatest significance was not in the details of the analysis of American English, which is very elegant, though nothing to sweep the board, but its conception of the relation between phonology and phonetics, and that it was – indeed – a model of how phonology works in general.

It is hoped that the book will stimulate theoretical and descriptive research in tonal phonology. Possibly, the order 'theoretical and descriptive' places the wrong emphasis here: 'descriptive and theoretical' better expresses the fact that the number of languages that have been described in terms of the metrical–autosegmental model, a term we owe to Bob Ladd (1996), is still limited. An important advantage of a well worked-out theory is that direct comparisons can be made across languages. Accurate and theoretically responsible descriptions provide the basis for theoretical innovation and improvements in our understanding of the nature of the object we study. There is a vast literature on tonal systems in the languages of Africa and Asia, but in spite of many years of dialectological research in Europe, the prosodic systems of varieties of well-known European languages are to all intents and purposes undescribed, while the same is true of most languages spoken elsewhere in the world.

Chapter 1 provides essential phonetic background information for empirically oriented students of prosody. Chapters 2 and 3 deal with basic typological categories like 'tone', 'stress', 'intonation', and 'accent'. Chapter 4 discusses the place of intonation in language. As implied above, an explicit formulation of the distinction between phonological representation and phonetic realization was a key feature of Pierrehumbert's 1980 thesis, and it accounts in no small measure for the recent progress in the field. Together with chapters 5 and 6, chapter 4 lays out the implications of the distinction. More so than has perhaps been realized, it is crucial to an understanding of the issue of the apparent universality of paralinguistic meaning. Chapters 5 and 6 attempt to explain how people know what the paralinguistic meanings of pitch variation are. These chapters also discuss the typical structural interpretations of these effects in specific languages.

Three general chapters follow: chapter 7 sets out the phonological configurations encountered in languages; while chapter 8 summarizes the ways that sentence prosody has been, or can be, dealt with in Optimality Theory.

An emphasis on the distinction between what is representational and what is due to the phonetic implementation naturally focuses our attention on the prosodic contrasts in languages. The language descriptions in chapters 9 to 15 provide illustrations of how phonological accounts capture sets of contrasting forms. These descriptions, which reproduce and expand on earlier analyses, are each biased towards specific aspects of prosodic structure, some of which are approached within an Optimality Theoretic framework. Basque and Japanese illustrate how tonal structures combine intonational and lexical tone in a situation where both are reasonably non-complex. Swedish and Norwegian provide examples of Germanic languages with a lexical tone contrast that is confined to the stressed syllable of the word. Language change is the focus of the next chapter, where the interaction between lexical and intonational tones is charted diachronically in a group of dialects spoken in Germany, the Netherlands, and Belgium. We continue with a chapter on French that provides an illustration of how a complex pattern of variation in accent distributions can be brought under control by the variable ranking of constraints. In that same chapter, a tonal grammar

is presented which shows how French is more complex than, say, Norwegian, but much less complex than English, which is treated in chapter 15. This chapter and chapter 14 are of interest because of the way in which the theoretical positions defended in the preceding chapters are applied to what must be the most thoroughly investigated language in the world. I have not resisted the temptation to introduce new elements in the description of these languages, despite the status of the book as a research summary. Given my background, the bias towards intonation in the choice of languages dealt with in these last chapters is hopefully forgivable.

1 July 2003 Carlos Gussenhoven
Nijmegen, The Netherlands

Acknowledgements

I first became acquainted with the topic of this book through a course called *Tone and Intonation* taught by Gillian Brown at the University of Edinburgh in 1968, where I spent my year abroad as a student of English. Between then and now, I have had many opportunities to learn from others, whether they were teachers, colleagues, students, or authors. I am very grateful to Christine Bartels for suggesting that I should write a book on intonation when she was still working for Cambridge University Press, for I don't think I would have done it without her encouragement. More recently, I have benefited greatly from the interaction with the co-ordinators of the ESF Network *Tone and Intonation in Europe* (2001–2004). I am also indebted to numerous people who posed questions and supplied corrections at workshops and conferences over the past years. I have asked a number of people to read drafts of selected passages of this book and incorporated their responses in the final text in various ways. None of them is, of course, responsible for the way I have done this and in particular any errors are mine only. For these responses I would like to thank Daniel Bühring, Aoju Chen, Yiya Chen, Nick Clements, Paul de Lacy, Gorka Elordieta, Rachel Fournier, Sónia Frota, Martine Grice, Larry Hyman, Haike Jacobs, René Kager, Gjert Kristoffersen, Haruo Kubozono, Aditi Lahiri, Jörg Peters, Brechtje Post, Henning Reetz, Stéphane Robert, Tomas Riad, Sotaro Kita, Annie Rialland, Jørgen Rischel, Joe Salmons, Lisa Selkirk, Hubert Truckenbrodt, Leo Wetzels, Keiko Yoshioka, as well as an anonymous reviewer engaged by the publisher. I would also like to thank those who were kind enough to record examples whose F_0 tracks are reproduced in the book: Joumard Alban, Arantzazu Elordieta, Eukene Elordieta, Stephanie van Elven, Nanna Haug Hilton, Hedy Kamara, Eric Kellerman, Sotaro Kita, Aditi Lahiri, Madeleine Lambrechts-Doecet, Yoshihisa Miura, Mariko Sugahara, Stéphane Tardy, Fumiko Uchiyama, Anne Wichmann and Nicole Verberkt. I am grateful to Femke Deckers and Wilske Driessen for producing these graphics with the help of the PRAAT program. These speech files, as well as representative speech files for the numbered examples throughout

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Abbreviations

AL	Analogical Lengthening
CON	constraint hierarchy (Optimality Theory)
CR	Compound Rule
DAT	digital audiotape
ERB	Equivalent Rectangular Bandwidth
ES	extra-sentential constituent
EVAL	evaluation procedure (Optimality Theory)
F_0	fundamental frequency
GEN	Generator (Optimality Theory)
Hz	hertz
IAD	Initial Accent Deletion
IO	Input–Output (Optimality Theory)
ip	Intermediate Phrase
MHG	Middle High German
ms	millisecond
NP	noun phrase
OCP	Obligatory Contour Principle
OO	output–output (Optimality Theory)
OSL	Open Syllable Lengthening
OT	Optimality Theory
PA	pitch accent
PP	prepositional phrase
RMS	Root Mean Square
RP	Received Pronunciation (Standard English accent in England)
s	second
S	root sentence (also: matrix sentence)
ST	semitone
SOV	Subject-Verb-Object

SVO	Subject-Object-Verb
ToBI	Tones and Break Indices
ToDI	Transcription of Dutch Intonation
VP	verb phrase
VOT	voice onset time
XP	syntactic phrase
XP'	maximal syntactic phrase

Symbols

^{1}	Accent 1
^{2}	Accent 2
´	high tone; primary stress
`	low tone; secondary stress
ˆ	falling tone
ˇ	rising tone
( )	accentual phrase or any other constituent below ϕ
[ ]	phonological phrase
{ }	intonational phrase
⟨ ⟩	utterance
ˈ	primary stress
ˌ	secondary stress
*	violation (Optimality Theory)
*!	fatal violation (Optimality Theory)
☞	winning candidate (Optimality Theory)
☞!	incorrectly selected winner (Optimality Theory)
*X	ungrammatical X; do not have X (Optimality Theory)
T*	accent marking tone
T-	Intermediate Phrase boundary tone
T%	intonational phrase boundary tone
!T	downstepped tone
T_x	boundary tone of constituent x
α	accentual phrase
ι	intonational phrase
Ⓣ	floating tone
μ	mora
ϕ	phonological phrase
σ	syllable
υ	utterance
ω	phonological word

Contents