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

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Voor Karel en Otto

Contents

Figures

Map

Tables

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
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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
ˊ	high tone; primary stress
ˋ	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