

## 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 discursive 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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# The Phonology of Tone and Intonation

**CARLOS GUSSENHOVEN**

*University of Nijmegen*



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## Contents

<i>List of figures</i>	<i>page</i> xi
<i>Map</i>	xiv
<i>List of tables</i>	xv
<i>Preface</i>	xvii
<i>Acknowledgements</i>	xx
<i>List of abbreviations</i>	xxii
<i>List of symbols</i>	xxiv
<b>1 Pitch in Humans and Machines</b>	1
1.1 Introduction	1
1.2 Frequency of vocal fold vibration, fundamental frequency ( $F_0$ ), and pitch	1
1.3 Pitch tracks	3
1.4 Interpreting pitch tracks	5
1.5 Experimentation	10
1.6 Conclusion	11
<b>2 Pitch in Language I: Stress and Intonation</b>	12
2.1 Introduction	12
2.2 Stress	12
2.3 Intonation	22
<b>3 Pitch in Language II: Tone</b>	26
3.1 Introduction	26
3.2 Tone languages	26
3.3 Autosegmental representations of tone	28
3.4 Other sequential restrictions	36
3.5 Accent	36

viii	Contents	
3.6	Tonogenesis	42
3.7	Conclusion	47
<b>4</b>	<b>Intonation and Language</b>	<b>49</b>
4.1	Introduction	49
4.2	Intonation and the design features of language	50
4.3	A half-tamed savage	57
4.4	Experimental approaches towards establishing discreteness in intonation	62
4.5	Conclusion	69
<b>5</b>	<b>Paralinguistics: Three Biological Codes</b>	<b>71</b>
5.1	Introduction	71
5.2	Variation beyond the speaker's control	72
5.3	Motivations for control in speech production	72
5.4	Pitch register and pitch span	76
5.5	Biological codes in pitch variation	79
5.6	The Frequency Code	80
5.7	The Effort Code	85
5.8	The Production Code	89
5.9	Substitute phonetic features	90
5.10	Language-specific universal meaning?	92
5.11	Conclusion	93
<b>6</b>	<b>Downtrends</b>	<b>97</b>
6.1	Introduction	97
6.2	Declination	98
6.3	Downstep	100
6.4	Final lowering	110
6.5	Initial high pitch: reset	113
6.6	Three phonetic issues	116
6.7	Conclusion	121
<b>7</b>	<b>Tonal Structures</b>	<b>123</b>
7.1	Introduction	123
7.2	Historical background	125
7.3	Developments since 1986	133
7.4	Rhythmic adjustments of pitch-accent distribution	141
7.5	Conclusion	142
<b>8</b>	<b>Intonation in Optimality Theory</b>	<b>143</b>
8.1	Introduction	143
8.2	Gen, Eval, and Con	144
8.3	OT and the tonal representation	145



<b>Contents</b>	<b>ix</b>
8.4 Positional effects	157
8.5 OT and prosodic phrasing	159
8.6 Conclusion	167
<b>9 Northern Bizkaian Basque</b>	<b>170</b>
9.1 Introduction	170
9.2 Lexical representations	171
9.3 The Accentual Phrase	172
9.4 Unaccented $\alpha$ without default H*L	175
9.5 The Intermediate Phrase	176
9.6 The construction of ip	179
9.7 Basque focus	180
9.8 Conclusion	183
<b>10 Tokyo Japanese</b>	<b>185</b>
10.1 Introduction	185
10.2 Lexical accent	186
10.3 The $\alpha$	186
10.4 The tonal structure of Utterances with one $\alpha$	187
10.5 Phonetic implementation of a one- $\alpha$ Utterance	189
10.6 An OT analysis of the tonal structure	192
10.7 More than one $\alpha$ : secondary association and interpolation	197
10.8 The Intermediate Phrase	199
10.9 The Utterance: $L_v$ and $H_v$	201
10.10 Japanese focus	204
10.11 Conclusion	206
<b>11 Scandinavian</b>	<b>209</b>
11.1 Introduction	209
11.2 Stockholm Swedish	210
11.3 An OT analysis of Swedish tone	216
11.4 East Norwegian	217
11.5 An argument for pre-linking	222
11.6 Danish	223
11.7 Conclusion	226
<b>12 The Central Franconian Tone</b>	<b>228</b>
12.1 Introduction	228
12.2 Tonogenesis	230
12.3 The first stage	232
12.4 Improving the interrogative contrast	235
12.5 Improving the contrast in $\iota$ -final declaratives	241
12.6 Outside the focus	243

x	Contents	
	12.7 Other reinterpretations	244
	12.8 Conclusion	249
<b>13</b>	<b>French</b>	<b>253</b>
	13.1 Introduction	253
	13.2 Prosodic phrasing	254
	13.3 The tonal analysis	266
<b>14</b>	<b>English I: Phrasing and Accent Distribution</b>	<b>274</b>
	14.1 Introduction	274
	14.2 The distribution of pitch accents	275
	14.3 Postlexical rhythm: $\phi$ -structure	278
	14.4 Intonational phrases	287
	14.5 Between the $\phi$ and the $\iota$	292
	14.6 Conclusion	294
<b>15</b>	<b>English II: Tonal Structure</b>	<b>296</b>
	15.1 Introduction	296
	15.2 Nuclear contours	296
	15.3 Pre-nuclear pitch accents	302
	15.4 Onsets	304
	15.5 Expanding the tonal grammar	305
	15.6 The vocative chant	313
	15.7 Tone Copy	315
	15.8 Some comparisons with Pierrehumbert and Beckman's analysis	316
	15.9 Conclusion	319
	<i>References</i>	321
	<i>Index</i>	345

## Figures

1.1	Sections of 25 ms from the speech waveform of male and female speaker	page 2
1.2	Continuous speech waveform and a digitized waveform	4
1.3	Incorrectly detected voicing and correctly analysed speech wave form	6
1.4	Halving error	7
1.5	Pitch falls in VCV-structures	8
1.6	Intrinsic $F_0$ pitch	9
1.7	Falls in British English and German on a pre-final syllable	10
2.1	$F_0$ tracks of two versions of <i>(He'll) kill us if he gets the chance</i>	13
2.2	$F_0$ tracks of <i>permit N, permit V, and work permit</i>	18
3.1	$F_0$ tracks of <i>Are you going to rinse</i> and <i>Are you going to play</i> in the dialect of Maastricht	45
4.1	Chickasaw declarative and interrogative intonation contours	54
4.2	Belfast English declarative and interrogative intonation contours	55
4.3	Bengali declarative and interrogative intonation contours	55
4.4	Discretely different British English pitch contours	56
4.5	$F_0$ contour of Roermond Dutch <i>Gaeler pepier</i>	60
4.6	Continuum of fifteen artificial contours for <i>Only a MILLionaire</i> and bimodal distribution of imitations	63
4.7	High rise and low rise in Dutch	64
4.8	Structure of 18 artificial contours used in 'surprise' experiment	65
4.9	Perceived surprise scores for different beginnings and endings of the high rise and the low rise	65
4.10	Idealized discrimination function in relation to the idealized identification function	67

xii	Figures	
4.11	Percentage ‘Question’ responses as a function of final $F_0$ in Dutch stimuli and percentage correct discriminations	68
5.1	Variations in pitch range	77
5.2	Phonetic implementations of two phonological contours for the sentence <i>Anna came with Manny</i>	78
5.3	$F_0$ plots of P1 and P2 for a large number of realizations of two phonological contours for the sentence <i>Anna came with Manny</i>	78
5.4	Percentage ‘Question’ judgements by Swedish listeners as a function of end pitch (x-axis) and peak height	83
5.5	Four phonologically different rising intonation contours in Dutch	84
5.6	Neutral and contrastive pitch accent on European Portuguese	87
5.7	Hypothesized relation between high peaks and late peaks	90
6.1	Average $F_0$ trajectories in all-H utterances by four speakers of Mandarin Chinese	99
6.2	Average $F_0$ peak values of H-toned syllables in Yorùbá	99
6.3	Downstep and declination in Japanese	101
6.4	Asymptote predicting the $F_0$ of five peaks in English utterances and mean actual $F_0$ of the five peaks. Near-linear descending downstepping with anticipatory raising in Dagara	111
6.5	$F_0$ of accent peaks in ‘A and B, but C’-type sentence and in ‘A, but B and C’-type sentence	114
6.6	Four pronunciations of Dutch <i>De mooïste kleren (en) de duurste schoenen</i>	115
6.7	Hypothetical $F_0$ contour with two projected reference lines	118
6.8	Upper and lower regression lines for four syntactic categories in Dutch	120
7.1	$F_0$ contours of Intermediate Phrases	126
9.1	Lexically unaccented $\alpha$ with default H*L and sequence of lexically accented $\alpha$ s	174
9.2	Long unaccented $\alpha$ and the same sentence with an $\alpha$ -break	177
9.3	Three different foci for <i>Amáien diruá emon nau</i>	183
10.1	$F_0$ tracks of Japanese accented and unaccented words	191
10.2	$F_0$ tracks of ten sequences of unaccented $\alpha$ and $\alpha$ with free first mora and H-toned first mora	199
10.3	Peak $F_0$ in first and third $\alpha$ in expressions containing different numbers of $\alpha$ s	201
10.4	Interrogative pronunciations of accented and unaccented Japanese words	202
10.5	Declarative and interrogative pronunciations of long unaccented $\alpha$	203
10.6	Three different foci for <i>mukasi banási</i>	205

Figures	xiii
11.1 Synthetic $F_0$ contours showing variation in initial, medial, and final peaks in Stockholm Swedish and identification scores for the compound interpretation	218
11.2 East Norwegian Accent 1 and Accent 2 with declarative intonation	221
11.3 Neutral and narrow focus in East Norwegian	222
12.2 Hypothesized phonetic lengthening of singular forms in Central Franconian	231
12.3 Accent 1 and Accent 2 in the dialect of Tongeren and in the dialect of Venlo	248
13.1 Six pronunciations of <i>au clair de la lune</i>	267
13.2 Downstepped contours in French	270
13.3 Leading H in French	271
15.1 Three left-hand contexts for English H*L	298
15.2 Four downstepping contours in English	308
15.3 Three $F_0$ manipulations of <i>Edinburgh is the capital of Scotland</i>	318

## Map

12.1 Northern part of the Central Franconian tonal area

*page 229*

## Tables

4.1	Examples of ‘unnatural’ declarative and interrogative intonation contours	<i>page 54</i>
5.1	Three biological codes and their physiological sources	95
10.1	Similarities and differences between Japanese and Basque Accentual Phrases	207
12.1	Hypothesized phonological interpretation of ANALOGICAL LENGTHENING as a lexical tone in Central Franconian (CF)	231
14.1	Intonational features compared across French, English, and Bengali	275

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## 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  
Nijmegen, The Netherlands

Carlos Gussenhoven

## 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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xxi

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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 <sub>0</sub>	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

**Abbreviations****xxiii**

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
^	falling tone
˘	rising tone
( )	accentual phrase or any other constituent below $\phi$
[ ]	phonological phrase
{ }	intonational phrase
< >	utterance
'	primary stress
,	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 <sub>x</sub>	boundary tone of constituent x
$\alpha$	accentual phrase
$\iota$	intonational phrase
Ⓣ	floating tone
$\mu$	mora
$\phi$	phonological phrase
$\sigma$	syllable
$\upsilon$	utterance
$\omega$	phonological word