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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Research Surveys in Linguistics

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The Phonology of Tone and Intonation

CARLOS GUSSENHOVEN

University of Nijmegen
Voor Karel en Otto
Contents

List of figures page xi
Map xiv
List of tables xv
Preface xvii
Acknowledgements xx
List of abbreviations xxii
List of symbols xxiv

1 Pitch in Humans and Machines 1

1.1 Introduction 1
1.2 Frequency of vocal fold vibration, fundamental frequency (F\textsubscript{0}), and pitch 1
1.3 Pitch tracks 3
1.4 Interpreting pitch tracks 5
1.5 Experimentation 10
1.6 Conclusion 11

2 Pitch in Language I: Stress and Intonation 12

2.1 Introduction 12
2.2 Stress 12
2.3 Intonation 22

3 Pitch in Language II: Tone 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
## Contents

3.6 Tonogenesis 42  
3.7 Conclusion 47

4 Intonation and Language 49  
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

5 Paralinguistics: Three Biological Codes 71  
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

6 Downtrends 97  
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

7 Tonal Structures 123  
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

8 Intonation in Optimality Theory 143  
8.1 Introduction 143  
8.2 Gen, Eval, and Con 144  
8.3 OT and the tonal representation 145
## Contents

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

Contents

12.7 Other reinterpretations 244
12.8 Conclusion 249

13 French 253
13.1 Introduction 253
13.2 Prosodic phrasing 254
13.3 The tonal analysis 266

14 English I: Phrasing and Accent Distribution 274
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

15 English II: Tonal Structure 296
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

References 321
Index 345
# Figures

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

4.11 Percentage ‘Question’ responses as a function of final F₀ 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 Anna came with Manny 78
5.3 F₀ plots of P1 and P2 for a large number of realizations of two phonological contours for the sentence Anna came with Manny 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 F₀ trajectories in all-H utterances by four speakers of Mandarin Chinese 99
6.2 Average F₀ peak values of H-toned syllables in Yorùbá 99
6.3 Downstep and declination in Japanese 101
6.4 Asymptote predicting the F₀ of five peaks in English utterances and mean actual F₀ of the five peaks. Near-linear descending downstepping with anticipatory raising in Dagara 111
6.5 F₀ 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 De mooiste kleren (en) de duurste schoenen 115
6.7 Hypothetical F₀ contour with two projected reference lines 118
6.8 Upper and lower regression lines for four syntactic categories in Dutch 120
7.1 F₀ contours of Intermediate Phrases 126
9.1 Lexically unaccented α with default H*Ł and sequence of lexically accented αs 174
9.2 Long unaccented α and the same sentence with an α-break 177
9.3 Three different foci for Amdíen dirua emon nau 183
10.1 F₀ tracks of Japanese accented and unaccented words 191
10.2 F₀ tracks of ten sequences of unaccented α and α with free first mora and H-toned first mora 199
10.3 Peak F₀ in first and third α in expressions containing different numbers of αs 201
10.4 Interrogative pronunciations of accented and unaccented Japanese words 202
10.5 Declarative and interrogative pronunciations of long unaccented α 203
10.6 Three different foci for mukasi banási 205
<table>
<thead>
<tr>
<th>Figures</th>
<th>xiii</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 Synthetic F₀ contours showing variation in initial, medial, and final peaks in Stockholm Swedish and identification scores for the compound interpretation</td>
<td>218</td>
</tr>
<tr>
<td>11.2 East Norwegian Accent 1 and Accent 2 with declarative intonation</td>
<td>221</td>
</tr>
<tr>
<td>11.3 Neutral and narrow focus in East Norwegian</td>
<td>222</td>
</tr>
<tr>
<td>12.2 Hypothesized phonetic lengthening of singular forms in Central Franconian</td>
<td>231</td>
</tr>
<tr>
<td>12.3 Accent 1 and Accent 2 in the dialect of Tongeren and in the dialect of Venlo</td>
<td>248</td>
</tr>
<tr>
<td>13.1 Six pronunciations of <em>au clair de la lune</em></td>
<td>267</td>
</tr>
<tr>
<td>13.2 Downstepped contours in French</td>
<td>270</td>
</tr>
<tr>
<td>13.3 Leading H in French</td>
<td>271</td>
</tr>
<tr>
<td>15.1 Three left-hand contexts for English H*L</td>
<td>298</td>
</tr>
<tr>
<td>15.2 Four downstepping contours in English</td>
<td>308</td>
</tr>
<tr>
<td>15.3 Three F₀ manipulations of <em>Edinburgh is the capital of Scotland</em></td>
<td>318</td>
</tr>
</tbody>
</table>
Map

12.1 Northern part of the Central Franconian tonal area

page 229
## Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Examples of ‘unnatural’ declarative and interrogative intonation contours</td>
<td>54</td>
</tr>
<tr>
<td>5.1</td>
<td>Three biological codes and their physiological sources</td>
<td>95</td>
</tr>
<tr>
<td>10.1</td>
<td>Similarities and differences between Japanese and Basque Accentual Phrases</td>
<td>207</td>
</tr>
<tr>
<td>12.1</td>
<td>Hypothesized phonological interpretation of ANALOGICAL LENGTHENING as a lexical tone in Central Franconian (CF)</td>
<td>231</td>
</tr>
<tr>
<td>14.1</td>
<td>Intonational features compared across French, English, and Bengali</td>
<td>275</td>
</tr>
</tbody>
</table>
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
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 Wetzel, 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, Hedv 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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the book, are available at www.let.kun.nl/pti I thank Gorka Elordieta, Sónia Frota, Matt Gordon, Esther Grabe, Judith Haan, Linda Heúmans, Vincent van Heuven, Minjoo Kim, Bert Remijsen, Chilin Shih and Henning Reetz for various kinds of help in obtaining recordings and figures, as well as several generations of students for their useful comments.

I worked on the book mainly in Nijmegen, where I was able to draw on the expertise of many colleagues, in particular Joop Kerkhoff and Toni Rietveld, but also spent time elsewhere. I enjoyed the generous hospitality of Aditi Lahiri during several fruitful periods spent at the University of Constance. Additionally, I spent four weeks at the University of Massachusetts Amherst and six weeks at the Institute for the Study of Languages and Cultures of Asia and Africa of the Tokyo University of Foreign Studies in 2000, and I thank Shigeki Kaji and Lisa Selkirk for their kind and effective efforts to make my life both useful and pleasant during those times.

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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
EV AL    evaluation procedure (Optimality Theory)
F0       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

xxii
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVO</td>
<td>Subject-Object-Verb</td>
</tr>
<tr>
<td>ToBI</td>
<td>Tones and Break Indices</td>
</tr>
<tr>
<td>ToDI</td>
<td>Transcription of Dutch Intonation</td>
</tr>
<tr>
<td>VP</td>
<td>verb phrase</td>
</tr>
<tr>
<td>VOT</td>
<td>voice onset time</td>
</tr>
<tr>
<td>XP</td>
<td>syntactic phrase</td>
</tr>
<tr>
<td>XP'</td>
<td>maximal syntactic phrase</td>
</tr>
</tbody>
</table>
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 φ
[ ] 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
T₁ 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