

Phonological Tone

From physiology and acoustics to patterning across languages, tone is one of the fundamental constructs in human languages and also among the hardest to apprehend. Drawing upon a large number of languages around the world, this volume explores the concept of tone, from its physical properties of articulation and acoustics to its manifestation in phonology. It is designed as a comprehensive study accessible to the novice and useful for the expert; each chapter covers a particular aspect of tone in increasing depth and complexity, weaving together key concepts and theories that provide complementary or competing accounts of tone's phonological intricacies. In the process, we uncover the underlying laws and principles that inform today's understanding of the subject to form a more synthesized view that also allows us to explore the relation of tone to other important areas of humanity such as literature, history, music and cognition.

LIAN-HEE WEE is professor and associate dean of arts at Hong Kong Baptist University. His research focuses on Chinese languages and Asian Englishes, contributing to phonological theorizing grounded in field and laboratory data, with extensions to music and poetry.

KEY TOPICS IN PHONOLOGY

Key Topics in Phonology focuses on the main topics of study in phonology today. It consists of accessible yet challenging accounts of the most important issues, concepts and phenomena to consider when examining the sound structure of language. Some topics have been the subject of phonological study for many years and are re-examined in this series in light of new developments in the field; others are issues of growing importance that have not so far been given a sustained treatment. Written by leading experts and designed to bridge the gap between textbooks and primary literature, the books in this series can either be used on courses and seminars, or as one-stop, succinct guides to a particular topic for individual students and researchers. Each book includes useful suggestions for further reading, discussion questions and a helpful glossary.

Already Published in the Series:

Neutralization by Daniel Silverman

Underlying Representations by Martin Krämer

Intonation and Prosodic Structure by Caroline Féry

Phonological Tone by Lian-Hee Wee

Phonological Tone

LIAN-HEE WEE

Hong Kong Baptist University



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press
978-1-107-12572-8 — Phonological Tone
Lian-Hee Wee
Frontmatter
[More Information](#)

CAMBRIDGE UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314-321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,
New Delhi - 110025, India

79 Anson Road, #06-04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781107125728

DOI: 10.1017/9781316410912

© Lian-Hee Wee 2019

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2019

Printed in the United Kingdom by TJ International Ltd. Padstow Cornwall

A catalogue record for this publication is available from the British Library.

Library of Congress Cataloging in-Publication-Data

Names: Wee, Lian-Hee, 1973– author.

Title: Phonological tone / Lian-Hee Wee, Hong Kong Baptist University.

Description: Cambridge ; New York, NY : Cambridge University Press, 2018. | Series:

Key topics in phonology | Includes bibliographical references.

Identifiers: LCCN 2018021912 | ISBN 9781107125728

Subjects: LCSH: Tone (Phonetics)

Classification: LCC P223 .W43 2018 | DDC 414–dc23

LC record available at <https://lccn.loc.gov/2018021912>

ISBN 978-1-107-12572-8 Hardback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

Cambridge University Press
978-1-107-12572-8 — Phonological Tone
Lian-Hee Wee
Frontmatter
[More Information](#)

*To Shiao-wei Tham, who introduced me to linguistics,
and the teachers whose lessons I'll never forget.*

Contents

<i>List of Figures</i>	<i>page ix</i>
<i>List of Tables</i>	<i>xii</i>
<i>Preface</i>	<i>xv</i>
<i>Acknowledgments</i>	<i>xxi</i>
1 Tone Basics	1
1.1 Invoking Tone	1
1.2 Pitch and Vocal Fold Vibration	3
1.3 Notation Based on Pitch	5
1.4 Tone as Contrastive	6
1.5 Probing into the Acoustic Correlates of Tone	10
1.6 Toward a Phonological Understanding	16
1.7 Chapter Summary	19
2 Autosegmentality and Associations	21
2.1 Where Tones Dock	21
2.2 Floating Tones	28
2.3 Autosegmentality	31
2.4 Autosegmental Tone for Phrasal Domains	37
2.5 Intonation and Autosegmentality	42
2.6 Intonating Lexical Tones	47
2.7 Chapter Summary	51
3 Discovery of Tone and Sub-Tonal Entities	53
3.1 Discovering Tone among the Ancients	53
3.2 Tone as Pitch Values	59
3.3 Tone as Features	64
3.4 Tone Contour as a Constituent	73
3.5 Register: Range of Tone Melodies	79
3.6 Feature Geometry of Tone	84
3.7 Tone Terraces	92
3.8 The Mysterious Upstep	103
3.9 Chapter Summary	107
	vii

viii	Contents
4	Tone Sandhi I: Phonetic or Phonological? 108
4.1	A Note on the Phonetic and the Phonological 108
4.2	Tone Sandhi 109
4.3	Articulatory Compromises 116
4.4	The Obligatory Contour Principle 124
4.5	Case Study: Tianjin Ditonal Sandhi 131
4.6	Case Study: Hakha Lai 138
4.7	Generativity of Tone Sandhi 139
4.8	Tone Sandhi Taxonomy 143
4.9	Chapter Summary 150
5	Tone Sandhi II: Phonological Analyses 152
5.1	Toward a Phonological Analysis 152
5.2	Variability in the Manifestation of Universal Laws 155
5.3	Chains and Spins 170
5.4	Ordering Effects 183
5.5	Transparency and Opacity 192
5.6	Chapter Summary 198
6	Interaction: Segments to Prosody 200
6.1	Segments and Tone 200
6.2	A Chinese Tone Story 214
6.3	An English Tone Story 226
6.4	Tone and Prosody 232
6.5	Chapter Summary 247
7	Cognitive Aspects of Tone 249
7.1	Musicality of Linguistic Tone 249
7.2	The Tone–Tune Interface 257
7.3	Tone and the Brain 264
7.4	Acquisition of Tones 271
7.5	Chapter Summary 275
	Glossary 276
	References 285
	Language Index 316
	Subject Index 319

Figures

1.1	Musical notes as an approximation of the Standard Chinese syllable [wei]	page 3
1.2	The larynx	4
1.3	Fundamental frequency (F0) profiles of Standard Chinese tones	11
1.4	The Standard Chinese syllable [ta ⁵⁵]	13
1.5	Amplitude profiles of Standard Chinese T3 [214]	14
2.1	The moraic model of the syllable	25
2.2	A moraic representation of Thai tones	25
2.3	Tones associated to feet in Kera	27
2.4	A possible account of Table 2.4	31
2.5	Tone association in Mende	34
2.6	Kimatuumbi phrasal H insertion rule	38
2.7	Syntactic representations of Example 2.11 and Example 2.12	39
2.8	Singapore English word boundary H	42
2.9	Intonation pattern in German	43
2.10	F0 profiles of incredulous intonation in English	45
2.11	Intonation productions in Hong Kong English	50
3.1	Sukhothai consonants circa 1300	58
3.2	Concentration of languages with complex tones	65
3.3	Tone melodies in Hangzhou	72
3.4	Disyllabic tone pattern in Northern Wu Chinese	72
3.5	Tone contour as a constituent	76
3.6	Possibilities of tone contour as an autosegmental constituent	76
3.7	Contour by constituency of tone-bearing units	77
3.8	Derived tone contour effect in Tianjin trisyllabic truncation	78
3.9	Relating register and contour	86
3.10	A complex model of tone	91
3.11	Pitch tracings of words read consecutively	93
		ix

x	<i>List of Figures</i>
3.12 List reading downtrend	94
3.13 List reading of monosyllabic words	95
3.14 Pitch profiles of utterances from Cantonese	96
3.15 Downdrift and downstep in Dschang	97
3.16 Tone terracing in Kikuyu	99
3.17 Downstep not at site of deleted L	100
3.18 Hyman's three-tiered model	101
3.19 Downstep in Dschang using Hyman's model	101
3.20 Local register spreading in Chaozhou	102
4.1 Pitch profiles of Standard Chinese tones	111
4.2 Pitch profiles from Beijing speakers	113
4.3 Pitch profiles from Taiwan speakers	114
4.4 Naming the components of tone sandhi	115
4.5 Compatible and conflicting collocation of tones	117
4.6 Possible tonal transitions in terms of pitch profiles	117
4.7 Pitch and tone contours	120
4.8 Compromising rising pitch contours	121
4.9 Compromising falling pitch contours	122
4.10 Downstep for OCP avoidance in Cilungu	127
4.11 Levels to which OCP can apply	130
4.12 Seventeenth-century depiction of Tianjin	133
4.13 F0 profiles of Tianjin tones	134
4.14 Tianjin tones	135
4.15 Tone absorption	135
4.16 Comparative correct response rates for sandhi tones	141
5.1 An optimality theoretic tableau	154
5.2 An optimality theoretic model of grammar	154
5.3 Unaffixed tone patterns in Margi	160
5.4 Margi tone spread	161
5.5 Tone spread in Margi	162
5.6 Constraint-ranking hierarchy for Margi	162
5.7 Downstep for OCP avoidance in Cilungu	163
5.8 Downstep as optimal in Cilungu	163
5.9 Blocking of H-spread in Shona	165
5.10 Tone deletion in Rimi	166
5.11 Register change in Leling	166
5.12 Tones in Wenbao Village Hakka	167
5.13 Non-sandhi in Wenbao	168
5.14 Triggering the chain shift with anti-faithfulness	174
5.15 Tone displacement in Jiaoxian, Tone insertion in Jiaoxian	175
5.16 Triggering the spin for the Taiwanese chain shift	178
5.17 Shortfall of $\neg \text{IDENT}_{\text{O-O}}$ [T] with /Lr,h/	179

<i>List of Figures</i>	xi
5.18 Shortfall of $\neg \text{IDENT}_{\text{O-O}}$ [T] with /Lr,hl/	179
5.19 Chain reactions with PC	180
5.20 Deriving /Lr,lh/ \rightarrow [Lr,h]	181
5.21 An optimality theoretic derivation of /RRL/ \rightarrow RFL	185
5.22 Erroneous predictions	186
5.23 Tone reduction as lexicalization in Standard Chinese	194
5.24 Tachoni toneless verbs with near future tense H	196
5.25 Tachoni H-toned verbs with near future tense H	197
6.1 Voicing and tone in an autosegmental framework	202
6.2 Line-crossing using [stiff, slack] features for tones	205
6.3 An account of tone-segment interaction	206
6.4 Autonomy of phonological tone	207
6.5 <i>Shuowen Jiezi</i> Chinese dictionary	216
6.6 A page from <i>Yunjing</i> Chinese rhyme table	218
6.7 A page from <i>Zhongyuan yinyun</i> rhyme book	220
6.8 Rough chronology of Chinese	222
6.9 Rough chronology of Chinese tonogenesis	224
6.10 Cantonese transliteration of <i>thunder</i> in <i>Chinese-English</i> <i>Instructor</i>	229
6.11 Tone patterns in Standard Japanese	234
6.12 Positional faithfulness to prosodic head in sandhi-triggering tone sequence	238
6.13 Multi-tiered headship	239
6.14 Tone groups in Xiamen	241
6.15 Stressed syllables aligned with musical accents	244
6.16 A schematic representation of a Tang verse stanza	245
7.1 Harmonics as seen on a vibrating string	252
7.2 Deriving a scale using harmonics	252
7.3 Excerpt from <i>Ferrying Peach Blossom</i>	258
7.4 Tone-tune mismatches in Standard Chinese	259
7.5 “Go to Dark Gethsemane,” seventh and eighth measure	260
7.6 Zimbabwe’s traditional song <i>Nyiti Dzaiibva</i>	263
7.7 Pitch profile consistency with a fourteen-day time lag in Shicheng Hakka	265
7.8 Pitch profile consistency with a fourteen-day time lag in Japanese	266
7.9 Pitch profile consistency with a fourteen-day time lag in British English	267

Tables

1.1	Notation systems for pitch profiles/tones	<i>page 6</i>
1.2	Tones in Thai, Yoruba, Wàpā and Igala	7
1.3	Tones for grammatical category contrasts in Cantonese	8
1.4	Tones for case in Somali	8
1.5	Tones in Standard Chinese	11
1.6	Vietnamese as a six-tone language	16
1.7	Ditonal concatenation in Standard Chinese	18
2.1	Contoured tones licensed by having an adequate number of segments	23
2.2	Thai tones and syllables	24
2.3	Tone patterns and foot structure in Kera trisyllabic words	27
2.4	Distribution of English nasal-plosive clusters	31
2.5	Mende and Kukuya	32
2.6	Margi stems	34
2.7	Thai tones across grammatical contexts	48
2.8	Phonetic characteristics across different attitudes	49
3.1	Metaphorical description of Old Chinese Tones (circa fourteenth to seventeenth century)	55
3.2	Tone notation in Gwoyeu Romatzyh for Standard Chinese	57
3.3	Tone inventories from some Han Chinese languages	64
3.4	Tone features (Wang 1967)	67
3.5	Tone Features (Woo 1969, Halle & Stevens 1971)	70
3.6	Tone inventory of Songjiang	79
3.7	Variation in tone of non-final Chaozhou syllables	80
3.8	Height distinctions of tone using registers and features	81
3.9	Tibetan tone and register alternation	83
3.10	Tone inventory of San Juan Copala (Trique)	88
3.11	Hangzhou and Lanzhou tones	89
4.1	Standard Chinese tones	110
4.2	Tone inventory for Tianjin	133
4.3	Hakha Lai tone inventory and ditonal sandhi	138
4.4	Taiwanese tone sandhi circle	140

<i>List of Tables</i>	xiii
4.5 Comparison between sandhi tones of real words and of nonce words	143
5.1 Taiwanese tone sandhi circle	171
5.2 Jiaoxian tone chain shift with reduction	175
6.1 Tones in Songling	211
6.2 Tones in some modern Chinese languages with their Middle Chinese categories	220
6.3 Traditional Vietnamese tone names influenced by Middle Chinese categories	221
6.4 Boshan tone categories and their Middle Chinese sources	225
6.5 Comparison of <i>CEI</i> tone choices and Modern Hong Kong English tone sequence	230
7.1 Comparison of pitch ranges across twenty Chinese languages	255
7.2 High-low quotients across Cantonese tones	256
7.3 A global perspective on tone–tune correspondence	263

Preface

Like other volumes in this series, this is intended as a compact, one-stop readable reference on its topic, in this case, the study of tone in the field of phonology. It is not a textbook, a book-length treatment on a specific aspect of tone, or an indexed set of topics to be used like a small handbook or encyclopedia. As a research monograph, this work weaves together different strands of phonological understanding from new fieldwork data, as well as improved studies in phonetics, historical linguistics, dialectology and even cognition. Unlike earlier works on this subject, a common thread runs through the chapters in this volume as we move into the 2020s connecting the various areas of tonological studies that might not have been obvious before. Thus, this volume supplements landmark precedent works such as Yip (2002), Chen (2000), van der Hulst & Snider (1993) and Fromkin (1978), among many others, by drawing upon their insights and by connecting them to research that came after them.

Juxtaposition of the many different strands of research is something not often found in books on tonological research, and I hope that this approach will facilitate dialogue between tonologists of different persuasions: theoretical, phonetic, dialectological, historical and, possibly, cognitive. The dangers of designing such a volume are obvious: inadequate treatment of each of the sub-fields or foci so disparate that the topics fail to combine into a coherent reading. Where possible, I have tried to explain the connections and to make explicit the areas where our understanding must remain open to review and revision. For example, although I offer the OBLIGATORY CONTOUR PRINCIPLE (OCP) as a universal and important force in tone alternations in Chapter 4, non-OCP analyses are also considered in view of where OCP might have fallen short. Ultimately, the chapter provides a taxonomy of tone sandhi types that is offered as an invitation for sandhi enthusiasts to find what might be a better, all-encompassing

theory. Similarly, the optimality theoretic (OT) analyses offered in Chapter 5 are tempered by opaque phenomena of various types. Such a presentation creates an air of uncertainty in our understanding, but at least there will be no false sense of security.

With the rapid ballooning in the mass of extant research, a compact volume such as this must necessarily make difficult choices on what to include. Data-wise, this volume takes a two-prong approach. On the one hand, it inherits classic data from previous studies. On the other hand, it features more recent discoveries reported in quality research dissertations, important conference proceedings and fieldwork studies. Sources too antiquated or too recent are likely to be obscure, and URLs, where available, are provided in addition to bibliographical information. In all cases, the author has tried to provide the fullest picture of the data possible within the constraints of space. Another special feature of this volume is its presentation of historical material so that the reader can see how certain modern concepts have evolved, not just out of the genius of a few linguists but as a continued collaborative effort across time and space. For example, tonologists tend to present studies on tone representation only in terms of theoretical studies that begin in the 1960s (Wang 1967, Woo 1969 and later works). However, experts have been working on that in modern China since the 1920s, the ancient Thais since the thirteenth century, and the ancient Chinese since the fifth century! In writing a new volume on phonological tone, it is perhaps time also to remember the old that has fallen by the wayside.

As a volume in the *Key Topics* series, this work can potentially be used as a textbook for advanced undergraduate classes or early postgraduate classes in the area of tone. To facilitate such usage, the volume offers Discussion Questions to encourage independent exploration. The Discussion Questions may look like exercises, but they are in fact real problems that might threaten the analytical views presented in the volume. As such, they are intended as germinates for research, potentially suitable as term papers or something larger, depending on the student's take. For those among us not used to exploration in a labyrinth, this volume is going to lead to a swimming headache and a deep sense of insecurity, because every piece of "knowledge" is so tentative. In the end, one should not claim to have obtained any conclusive "knowledge of phonological tone" at all, other than a sense of the many issues surrounding the concept. My hope is that the student reader will feel armed with the arsenal of theoretical understanding built by wise phonologists past and

present, and then be driven by the insecurities of our limitations to dig deeper and further through new angles of thought, innovative methods of experimentation and fresh approaches in field studies.

Different phonologists at different times have found their way into the fascinating area of tonology. This book is my take in constructing what I hope is a scenic route toward understanding phonological tone. Chapter 1 begins with figuring out why one should believe that there is such a thing as tone at all. In the past, this was motivated simply by providing minimal pairs where pitch/fundamental frequency (F0) is arguably contrastive. However, such an approach oversimplifies the argument for tone, because F0 is also an acoustic correlate of stress, and tone has other articulatory/acoustic correlates. In Vietnamese for example, phonation comes into play as well. This chapter introduces some rudimentary concepts in the description and notation of tone in relation to both phonetic properties and phonological contrasts, paving the way for phonological exploration of the topic.

Chapter 2 addresses the phonological units that are thought to be associated with tone. Traditionally, tone is assumed to be part of a syllable and serves to provide contrast, particularly lexical or word-level contrast. However, a comparison of patterns in various languages will reveal that tone-bearing units may include a range of linguistic entities ranging from segments, syllables, feet and words to even larger domains such as phrases. Further, tones can float and thus vary in their choice of association. All these factors lead us to the idea that tones are autosegments, i.e. autonomous phonological units independent of the segments through which the phonetic properties of a tone are manifest. Autosegmentality thus offers a unified study of pitch-related phenomena across lexical and post-lexical levels. This enables the integration of studies on tone and INTONATION through autosegmentality, a position that has been gaining acceptance since the 2000s.

Chapter 3 looks into the components that make up tone: register, CONTOUR and features. The chapter begins with the stirrings of antiquity in tonal representation, before leading to data from fieldwork studies. These became the foundations of modern tone notation, which in turn precipitated a theory of features. Exactly what features are involved would depend on one's theory, but the general idea is that one must capture the shape of the tone (level, rising, falling, dipping or peaking) as well as the number of levels of contrast across the tones in a given language. These two properties are best captured in terms of register and contour. Register

provides information on the pitch range within which a given tone is articulated; contour provides a description of the shape. In principle, one can use the same set of features for both register and contour, so that [high] register indicates that the tone contour is articulated in the upper half of the pitch range, whereas [high] contour indicates that the shape is a high flat tone corresponding to the register in which it is articulated. CONTOURED pitch profiles can then be described in terms of a concatenation of features. In practice, however, some linguists might use different notations to distinguish register and contour for clarity of exposition. With tone features (for register and for contour alike), the chapter moves on to discuss the geometry of how the features are organized to make tone. A number of different models are available in the literature, although consensus appears to be shifting toward a model where register and contour are two separate constituents that together comprise a tone. Drawing on Chapter 2, it can be seen that the tone, with its complex structure, is nonetheless an autosegment that can be associated with different TBUs such as the syllable, foot or phrase. This conception provides a way of understanding tone terraces in which a string of syllables appears to exhibit the confinements of pitch range akin to registers.

Chapter 4 looks into the phenomenon of tone alternation to raise the question of their phonetic or phonological natures, making a distinction between what is part of the physiology and what is part of the abstract mental system. Distinguishing the two is not straightforward, although, where possible, a phonetic solution is favored as the null hypothesis, since that is directly grounded on physiology and avoids postulation of abstract phonological entities. However, there are cases where a phonetic solution is clearly inadequate, especially when the result of tone alternation does not always favor phonetic ease (articulatory or even perceptory). Phonological explanations would thereby have to be evoked. The chapter ends with a set of tone alternation phenomena that a tonologist might face, leading to the phonological explorations of the following chapter.

Chapter 5 expounds on possible underlying phonological explanations of tone alternation patterns. It is largely set within an OT framework because of the framework's explicit requirement to account for patterns across languages using the same set of "universal" constraints. This does not commit one to being an OTist, but it does prize efforts to explain tone patterns using the same

linguistic principles (that is, the typology of languages) over language-specific rules that are repetitive across languages.

The preceding chapters focus almost exclusively on tone as an autonomous unit. Chapter 6 trains its sights on tone through interaction with other aspects of phonology. It looks at such effects with segments as well as with prosody. In both cases, it turns out that modern synchronic patterns are mirrored in diachronic processes of *TONOGENESIS*. The chapter ends with a discussion on the relation of tone and prosody, exploring in particular how tone behaviors correlate with prosodic prominences, as well as the possibility that tone might be used for poetic meter. The study of tone within the boundaries of linguistics ends here, and Chapter 7 brings us to the threshold to glimpse the cognitive aspects of tone.

Chapter 7 ventures beyond linguistics to look at cognitive aspects of tone. In particular, this chapter explains how one must be wary of drawing a simplistic and direct correlation between tone and music, even though a study of the tone-music interface is a worthy one. It turns out that, while there is no musical advantage to speakers of languages where tone is lexically contrastive, tone is processed in the brain in intricate ways that researchers are only beginning to understand. It appears that the auditory cortex must sort out when pitch information is linguistic and then trigger activity accordingly in relevant parts of the brain. As far as acquisition of tone is concerned, research appears to have been narrowly focused on Standard Chinese (a Han language), presumably because of market forces. Thus ends the seven-chaptered journey in this exploration of tone. It begins with the phonetic properties of tone, moving on to tone's autosegmentality, its internal compositionality and its phonological analysis. From there, the exploration of tone moves into a discussion of its interaction with other aspects of phonology and its genesis, before ending further afield in the areas of music and cognition.

This book does not assume that the reader has any prior knowledge of tone, but it does require the reader to have had some exposure to phonetic and phonological training, particularly the ability to read phonetic symbols. The reader should also be familiar with linguistic concepts such as syllables, stems and affixes and basic word classes such as nouns, verbs and adjectives. Some basic music education would also come in handy. Throughout the volume, the first occurrence of any term explained in the glossary will be in SMALL CAPS. Languages mentioned in this book are also included in a language index.

Writing a book like this presents the challenge of dealing with too many possibilities, and I can only provide a much smaller coverage of the myriad data that has fascinated so many linguists before (and, with hope, after) me. This is not to say that this book does not have a central set of theses. Through the chapters, the book hopes to make a case (i) for tone as a phonological concept that is best viewed as autosegmental and that may associate with various types of TBUs, (ii) for the importance of also studying the physical phonetic correlates without which phonological tone cannot be manifested and (iii) for a place for the study of tone among the cognitive sciences.

Acknowledgments

I could not have authored this book if not for the confidence of William S. Y. Wang. Throughout the process of writing, I have found support, encouragement and also valuable advice from Will Leben, Diana Archangeli, James Myers, Yuchau E. Hsiao, Yen-Hwei Lin, Long Peng, Hubert Truckenbrodt, Feng-fan Hsieh, Jason S. Polley, John C. Wakefield, Mingxing Li, Janice W. S. Wong and others who, if I have missed them in this list, must demand a drink offering as token of my apology. Will, in particular, generously offered insightful and helpful comments on almost every page. James Myers' long list of comments has similarly rectified many of my awful mistakes. There will be no way I can repay them for providing me with so much of their wisdom and knowledge. I can only hope to do the same for others in the future.

For data and experiments in Chapter 7, I thank Kobayashi Kaoru, Feng Yun, Huang Tingting, Li Hui, John Wakefield and Patricia Warren. Many of my students provided useful feedback to ensure the accessibility and relevance of this book to a wider readership, and I am especially appreciative of the efforts of Olivia N. W. Tam (who made painstaking annotations in many drafts), Snow Jialing Hu, Benjamin Lam, Tam Kwok-Ho and Gigi To. Special thanks go to Yang V Liu and Yuting Li for their unwavering assistance, discussions and copy-editing. Modern networking on the Internet, for example on ResearchGate, has also allowed me to take the pulse of the field through interaction with the scholars active there, particularly Stephen Politzer-Ahles and Mike Golding. Helen Barton has been a most wonderful editor without whom this book would remain only an imaginary entity. The author is also grateful to the many critical and helpful comments from reviewers whose anonymous efforts are too often undervalued.

All copyright materials and images are acknowledged where they appear in the texts. I wish to formally register my thanks to these

authors and publishers for the permission to use them in this volume.

Finally, thanks to Winnie H. Y. Cheung, whose love went beyond sustaining me to reading and critiquing much of my writing. All remaining flaws are mine.