Optimality Theory

This is an introduction to Optimality Theory, the central idea of which is that surface forms of language reflect resolutions of conflicts between competing constraints. A surface form is ‘optimal’ if it incurs the least serious violations of a set of constraints, taking into account their hierarchical ranking. Languages differ in the ranking of constraints; and any violations must be minimal. The book does not limit its empirical scope to phonological phenomena, but also contains chapters on the learnability of OT grammars; OT’s implications for syntax; and other issues such as opacity. It also reviews in detail a selection of the considerable research output which OT has already produced. Exercises accompany chapters 1–7, and there are sections on further reading. Optimality Theory will be welcomed by any linguist with a basic knowledge of derivational Generative Phonology.

RENÉ KAGER teaches linguistics at Utrecht University, the Netherlands.
CAMBRIDGE TEXTBOOKS IN LINGUISTICS


OPTIMALITY THEORY
## CONTENTS

**Preface**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conflicts in grammars</td>
<td></td>
</tr>
<tr>
<td>1.1 Introduction: goals of linguistic theory</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Basic concepts of OT</td>
<td>3</td>
</tr>
<tr>
<td>1.3 Examples of constraint interaction</td>
<td>14</td>
</tr>
<tr>
<td>1.4 The architecture of an OT grammar</td>
<td>18</td>
</tr>
<tr>
<td>1.5 Interactions of markedness and faithfulness</td>
<td>27</td>
</tr>
<tr>
<td>1.6 Lexicon Optimization</td>
<td>32</td>
</tr>
<tr>
<td>1.7 A factorial typology of markedness and faithfulness</td>
<td>34</td>
</tr>
<tr>
<td>1.8 On defining segment inventories</td>
<td>43</td>
</tr>
<tr>
<td>1.9 Conclusion</td>
<td>47</td>
</tr>
<tr>
<td>2. The typology of structural changes</td>
<td>52</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>52</td>
</tr>
<tr>
<td>2.2 Nasal substitution and related effects</td>
<td>59</td>
</tr>
<tr>
<td>2.3 The typology of *NČ effects</td>
<td>78</td>
</tr>
<tr>
<td>2.4 Conspiracies of nasal substitution and other processes</td>
<td>83</td>
</tr>
<tr>
<td>2.5 Conclusion: a comparison with rule-based theory</td>
<td>86</td>
</tr>
<tr>
<td>3. Syllable structure and economy</td>
<td>91</td>
</tr>
<tr>
<td>3.1 Introduction</td>
<td>91</td>
</tr>
<tr>
<td>3.2 The basic syllable typology</td>
<td>92</td>
</tr>
<tr>
<td>3.3 Epenthesis and the conflict of well-formedness and faithfulness</td>
<td>98</td>
</tr>
<tr>
<td>3.4 Generalized Alignment</td>
<td>117</td>
</tr>
<tr>
<td>3.5 The quality of epenthetic segments</td>
<td>124</td>
</tr>
<tr>
<td>3.6 Coda conditions</td>
<td>130</td>
</tr>
<tr>
<td>3.7 Conclusion</td>
<td>139</td>
</tr>
</tbody>
</table>

© Cambridge University Press

www.cambridge.org
Contents

4 Metrical structure and parallelism 142
  4.1 Introduction 142
  4.2 Word stress: general background 143
  4.3 Case-study: rhythmic lengthening in Hixkaryana 148
  4.4 A set of metrical constraints 161
  4.5 Case-study: rhythmic syncope in Southeastern Tepehuan 177
  4.6 Conclusions 189

5 Correspondence in reduplication 194
  5.1 Introduction 194
  5.2 Reduplicative identity: the constraints 201
  5.3 From classical templates to generalized templates 216
  5.4 From circumscription to alignment 223
  5.5 ‘Classical’ versus OT-based prosodic morphology: conclusions 229
  5.6 Overapplication and underapplication in reduplication 230
  5.7 Summary of Correspondence Theory 248

6 Output-to-output correspondence 257
  6.1 Introduction 257
  6.2 Identity effects in truncation 259
  6.3 Identity effects in stem-based affixation 273
  6.4 The cycle versus base-identity 277
  6.5 Output-to-output correspondence: conclusions 293

7 Learning OT grammars 296
  7.1 Introduction 296
  7.2 Learning constraint rankings 297
  7.3 Learning the Pintupi grammar of stress 300
  7.4 The learning algorithm: discussion 321
  7.5 Learning alternations and input representations 324

8 Extensions to syntax 341
  8.1 Introduction 341
  8.2 OT and syntax 341
  8.3 The structure of extended verbal projections in English 353
  8.4 Typological consequences 366
  8.5 Conclusions 369
## Contents

9 Residual issues 372  
  9.1 Introduction 372  
  9.2 Opacity 372  
  9.3 Absolute ungrammaticality 400  
  9.4 Free variation 404  
  9.5 Positional faithfulness 407  
  9.6 Underlying Representations versus allomorphy 413  
  9.7 Conclusion: future perspectives 420  

References 425  
Index of languages 445  
Index of subjects 447  
Index of constraints 451
PREFACE

This book presents an introduction to Optimality Theory, a grammatical framework of recent origin (Prince and Smolensky 1993; McCarthy and Prince 1993a, b). The central idea of Optimality Theory (OT) is that surface forms of language reflect resolutions of conflicts between competing demands or constraints. A surface form is ‘optimal’ in the sense that it incurs the least serious violations of a set of violable constraints, ranked in a language-specific hierarchy. Constraints are universal, and directly encode markedness statements and principles enforcing the preservation of contrasts. Languages differ in the ranking of constraints, giving priorities to some constraints over others. Such rankings are based on ‘strict’ domination: if one constraint outranks another, the higher-ranked constraint has priority, regardless of violations of the lower-ranked one. However, such violation must be minimal, which predicts the economy property of grammatical processes. OT’s basic assumptions and the architecture of OT grammars will be dealt with in chapters 1 and 2.

Optimality Theory is a development of Generative Grammar, a theory sharing its focus on formal description and quest for universal principles, on the basis of empirical research of linguistic typology and (first) language acquisition. However, OT radically differs from earlier generative models in various ways. To accommodate cross-linguistic variation within a theory of Universal Grammar, OT assumes that universal constraints are violable, while earlier models assumed ‘parametric’ variation of inviolate principles. Moreover, OT is surface-based in the sense that well-formedness constraints evaluate surface forms only – no structural conditions are placed on lexical forms. Earlier models had assumed Morpheme Structure Constraints, resulting in the duplication of static and dynamic rules in phonotactics. In contrast, OT entirely abandons the notion of rewrite rule, dissociating ‘triggers’ and ‘repairs’. This serves to explain conspiracies: multiple processes triggered by a single output-oriented goal. Finally, OT also eliminates derivations, replacing these by parallelism: all constraints pertaining to some type of structure are evaluated within a single hierarchy. The comparison of OT and
its generative ancestors will be the topic of chapter 2, although the issue will reoccur in later chapters (specifically 4, 5, and 9).

Optimality Theory is not a theory of representations, but a theory of interactions of grammatical principles. More accurately, the issue of representations is orthogonal to that of constraint interaction. Therefore the divergence from earlier generative models is less clear-cut in this respect. Most OT literature on phonology, for example, assumes the representational alphabet of non-linear (metrical and auto-segmental) phonology. In this book, the emphasis will be on prosodic phenomena, partly reflecting a tendency in the field, and partly the research interests of the author. Some of OT’s most striking results have been reached in the domain of prosodically governed phenomena, such as syllable-dependent epenthesis (chapter 3), interactions of syllable weight and metrical structure (chapter 4), and prosodic targets in reduplication (chapter 5). However, our discussion of these phenomena serves to highlight results of OT that are relevant beyond prosody. To support this point, a range of segmental phenomena will be analysed throughout the book. Finally, OT has consequences for representational issues which are more closely connected with grammatical interactions, in particular for featural underspecification, as will be shown in chapters 1, 3, and 9.

Optimality Theory is a general theory of grammar, rather than one of phonology. Therefore this book is not limited in its empirical scope to phonological phenomena, but it also contains chapters on the learnability of OT grammars (chapter 7) and extensions to syntax (chapter 8). Finally, chapter 9 will address a number of important residual issues in OT, focussing on opacity, and discussing current developments in assumptions on lexical representations (versus allomorphy), optionality, absolute ungrammaticality, and various functionally oriented approaches to phonology.

During its brief period of existence, OT has sparked off a large output of articles, PhD dissertations, and volumes. Here we will review a selection of this research output, in a way that maximally highlights the theory’s contribution to insights into language. In chapters 2 and 5–8, one particular piece of research will be focussed on, while placing it against a broad theoretical background. Chapter 2 focusses on the analysis of post-nasal-obstruent-voicing effects by Pater (forthcoming), and serves to highlight factorial typology, OT’s explanation of conspiracies, and to introduce Correspondence Theory. Chapter 5 is devoted to the Correspondence Theory of reduplication by McCarthy and Prince (1995a, forthcoming), emphasizing ‘the emergence of the unmarked’ and parallelism of evaluation, and also extending the notion of ‘correspondence’ to relations between outputs. Chapter 6 discusses Benua’s (1995) paper on output-to-output correspondence in truncation, and its extensions to stem-based affixation, while comparing OT and derivational theory for ‘cyclic’ phenomena. Chapter 7 discusses work by
Preface

dependence on basic OT notions, such as strict domination, minimal violation,
and assumptions on lexical forms. Chapter 8 is devoted to the analysis of Wh-
movement and its relation with auxiliary inversion and $do$-support in English by
Grimshaw (1997), pointing out the relevance of OT outside phonology.

This book is not a general introduction to phonology, and the reader should
come equipped with a basic knowledge of derivational Generative Phonology,
including rules and representations, and some knowledge of Minimalist Syntax
for chapter 8. Exercises have been added to chapters 1–7 to increase analytic
skills and reflection on theoretical issues. Moreover, each chapter contains a list
of suggestions for further reading.

The idea for this book arose during a course I taught at the LOT summer school
at the University of Amsterdam in 1995. Stephen Anderson, who was present at
this course, suggested basing an OT textbook on its contents. For his role in
originating this book, I owe him special thanks.

Parts of this book are based on research reported on earlier occasions. Chapter
4 is partly based on Kager (1997a), first presented at the workshop on Derivations
and Constraints in Phonology, held at the University of Essex, September 1995.
Chapter 6 contains results from Kager (forthcoming), presented at the conference
on the Derivational Residue in Phonology, Tilburg University, October 1995. I
wish to thank the organizers of these events: Iggy Roca, Ben Hermans, and Marc
van Oostendorp. Research for this book was partly sponsored by the Dutch Royal
Academy of Sciences (KNAW), whose support is gratefully acknowledged.

For their comments on earlier versions of chapters I wish to thank Peter Ackema,
Stephen Anderson, Roger Billerey, Gabriel Drachman, Nine Elenbaas, Bruce
Hayes, Claartje Levelt, Ad Neeleman, Joe Pater, Bruce Tesar, Wim Zonneveld,
and an anonymous reviewer. These comments have led to a number of substantial
improvements. Needless to say, I take the blame for any mistakes in content or
my presentation of other researchers’ ideas. Thanks to Martin Everaert for supplying
the child language data discussed in chapter 7.

Finally, this book would not have been finished without the encouragement and
patience of my colleagues, friends, and family. Jacqueline, this book is dedicated
to you.