Contents

Acknowledgments xvii

I Preliminaries 1

1 Phonology and Theoretical Neuroscience 3
   Exercises .............................................. 5

2 Language as Knowledge 7
   2.1 A Grim Scenario: Introducing I-Language .............. 7
   2.2 Innateness and Universal Grammar ........................ 9
   2.3 Abstract Knowledge .................................. 10

3 Apologia 13
   Exercises .............................................. 18

4 Formalism with Sets 19
   4.1 Formalisms: A Justification ............................. 19
   4.2 Sets .................................................. 21
   4.3 Sets and Relations .................................... 22
      4.3.1 Set Membership ................................... 22
      4.3.2 Subset and Proper Subset Relations ............... 24
      4.3.3 Superset and Proper Superset Relations .......... 26
   4.4 Set Operations and Special Sets ......................... 28
      4.4.1 Set Intersection .................................. 28
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4.2 The Empty Set</td>
<td>29</td>
</tr>
<tr>
<td>4.4.3 Set Union</td>
<td>30</td>
</tr>
<tr>
<td>4.4.4 Set Subtraction</td>
<td>31</td>
</tr>
<tr>
<td>4.5 Intensional versus Extensional Definitions</td>
<td>32</td>
</tr>
<tr>
<td>4.6 Functions</td>
<td>34</td>
</tr>
<tr>
<td>4.7 Set Cardinality</td>
<td>37</td>
</tr>
<tr>
<td>4.8 Ordered Sets</td>
<td>38</td>
</tr>
<tr>
<td>Exercises</td>
<td>39</td>
</tr>
<tr>
<td>5 Suggested Reading</td>
<td>43</td>
</tr>
<tr>
<td><strong>II The Motivation for Phonological Rules</strong></td>
<td>45</td>
</tr>
<tr>
<td>6 Segmentation: Sound and Meaning</td>
<td>47</td>
</tr>
<tr>
<td>6.1 Do We Need Phonology?</td>
<td>47</td>
</tr>
<tr>
<td>6.2 Methods of Segmentation</td>
<td>48</td>
</tr>
<tr>
<td>6.3 The Lexicon</td>
<td>53</td>
</tr>
<tr>
<td>6.4 What’s Ahead?</td>
<td>55</td>
</tr>
<tr>
<td>Exercises</td>
<td>56</td>
</tr>
<tr>
<td>7 Rules: Yet Another Module of Grammar</td>
<td>57</td>
</tr>
<tr>
<td>7.1 Two Forms, One Meaning</td>
<td>57</td>
</tr>
<tr>
<td>7.2 In Search of an Explanation</td>
<td>61</td>
</tr>
<tr>
<td>7.2.1 Systematicity</td>
<td>62</td>
</tr>
<tr>
<td>7.2.2 Productivity</td>
<td>64</td>
</tr>
<tr>
<td>7.3 Phonological Rules and Morphemes</td>
<td>65</td>
</tr>
<tr>
<td>7.4 Derivation Tables</td>
<td>67</td>
</tr>
<tr>
<td>Exercises</td>
<td>70</td>
</tr>
<tr>
<td>8 Review</td>
<td>73</td>
</tr>
<tr>
<td><strong>III A Formal Model for Phonological Rules</strong></td>
<td>75</td>
</tr>
<tr>
<td>9 Formalization</td>
<td>77</td>
</tr>
<tr>
<td>9.1 Smurfs and Science</td>
<td>77</td>
</tr>
<tr>
<td>9.2 Expressibility</td>
<td>79</td>
</tr>
</tbody>
</table>
## Contents

V The Logic of Allophony 209

23 Splits without Neutralization 211

24 Rules as Generalizations 215
  24.1 Simplicity and Generalizations 216
  24.2 Environments Define Equivalence Classes 219
  24.3 Counting Environments 223
  24.4 Another Peek at Natural Classes 224

25 Allophones 227
  25.1 Allophony versus Neutralization 227
  25.2 Set Complements and Complementary Distribution 230
  25.3 Allophones Again 234
  25.4 Korean and the Status of Allophones 235

26 More on Distributional Patterns and Phonotactics 239
  26.1 Distributional Patterns 239
  26.2 Phonotactics 243
  Exercises 245

27 Confused Use of Complementary Distribution in Syntax 247

VI The Logic of Rule Interaction 249

28 Function Composition 251
  28.1 Order (Sometimes) Matters 251
  28.2 Demonstration of Rule Ordering 254
  Exercises 256

29 Rule Interactions I: Feeding 259
  29.1 Feeding: The Basic Pattern 259
  29.2 Defining Feeding 262
  29.3 A Non-ordering Solution: The Free Reapplication Model 264
  29.4 Neutralization and Homophony 266
  29.5 Complex SMDs 266
30 Rule Interactions II: COUNTERFEEDING  269
  30.1 COUNTERFEEDING: The Basic Pattern  269
  30.2 Rule Ordering for Strelitzian  270
  30.3 Direct Mapping for Strelitzian  272
  30.4 Choosing a Model  273
  30.5 More Complex SMDs  275
  Exercises  275

31 Combinatorics of Rule Ordering  277
  Exercises  280

32 Minimal Pairs and Complementary Distribution  281

33 Rule Interactions III: BLEEDING and COUNTERBLEEDING  287
  33.1 Bleeding  287
  33.2 Counterbleeding  290
  Exercises  292

34 Alternative Analyses  299
  Exercises  301

35 Getting Ready to Expand SPE  303

VII Suprasegmental Phonology  305

36 Metathesis  307

37 Length  313
  37.1 The Abstractness of Phonological Length  315
  37.2 Representing Length  318
  Exercises  320

38 Tone  323

39 Syllables I  327
  39.1 Discovering Syllables  327
  39.2 Syllables as Hierarchical Structures  330
  39.3 Intrasyllable Relations in Rules  333
Contents

39.4 Intersyllable Relations in Rules . . . . . . . . . . . . . . . . . . . . . 337
Exercises .................................................. 339

40 Syllables II ............................................. 343
40.1 Syllable Types ........................................ 343
40.2 Inferring Syllable Structure .......................... 348
40.3 Reasoning about Syllable Structure ................. 350
Exercises .................................................. 354

41 Stress ..................................................... 361
41.1 Fixed Stress ........................................... 362
41.2 Lexical Stress .......................................... 362
41.3 Weight and Stress ..................................... 364
41.4 Computing Stress with Feet ......................... 365
Exercise ................................................... 369

VIII Features and Feature Logic ................................ 371

42 Substrings and Sets of Strings .......................... 373

43 Beyond Perfect Datasets: What Can We Ignore? ...... 375
43.1 Equivalence Classes in Rules via Substrings ....... 375
43.2 Natural Classes of Segments in Rule Environments 378
43.3 Natural Classes of Segments in Rule Targets ....... 380

44 Using Properties in Rules ............................... 385

45 More on Rules with Properties ........................ 391
45.1 Natural Classes Defined by Generalized Intersection 391
45.2 Natural Classes and Epistemic Boundedness ........ 396
45.3 Properties and the ‘is-a’ Relation ................... 398
45.4 Rules Refer to Natural Classes ..................... 398
Exercises ................................................... 400

46 A Binary Model of Segment Properties ................ 401
Contents

47 The Features We’ll Use 407
  47.1 Vowels . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 408
  47.2 Consonants . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 412

48 Natural Classes with Features 419
  48.1 Rules with Natural Classes of Features . . . . . . . . . . . . . . . . 419
  48.2 More on Features and Segments . . . . . . . . . . . . . . . . . . . . 422
  Exercises . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 425

49 Building, Then Deconstructing, a Feature-Based Rule 431
  49.1 Using Features with ‘→’ . . . . . . . . . . . . . . . . . . . . . . . . . 431
  49.2 Deconstructing ‘→ ’: Two Steps to Devoicing . . . . . . . . . . . . . 433
  49.3 Segment Mapping Diagrams and the Two-Step Process . . . . . . . . 438

50 Failure of Minimal Pairs 441
  Exercises . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 446

51 Reciprocal Neutralization Revisited 449
  51.1 Hungarian Voicing Assimilation . . . . . . . . . . . . . . . . . . . . . 449
  51.2 Expressing “The Same Value” . . . . . . . . . . . . . . . . . . . . . . 451
  51.3 Expressing “The Opposite Value” . . . . . . . . . . . . . . . . . . . . 452
  51.4 A Two-Step Analysis of Hungarian Reciprocal Neutralization . . . . 453
  51.5 No “Existential” α . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 454
  Exercises . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 455

52 Nothing IV: Non-surfacing URs Revisited 457
  Exercise . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 463

53 Turkish Vowel Harmony I 465
  Exercises . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 474

54 Discussion: Surface Segments and SMDs 475
  Exercises . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 477

55 Turkish Vowel Harmony II 481
  Exercise . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 488

56 Turkish Vowel Harmony III 489
  Exercises . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 495
Contents

57 Greek Letter Variables and Quantification in Rules 499
  57.1 Further Thoughts on Greek Letters 499
  57.2 Identity Conditions in Rules 501
  57.3 Non-identity Conditions in Rules 509
  Exercises 513

58 Applying What We Have Learned—Lamba 521
  Exercises 526

59 High Quality Ignorance 529
  59.1 Overview of the Data 530
  59.2 First Analysis: Two Aspirating Rules 531
  59.3 Second Analysis: One Aspirating Rule 533
  59.4 The Benefits of Commitment 535
  Exercises 536

60 The Remote and Complex Phonology of the English Plural 539
  60.1 The Extension of the Target: A Toy Example 540
  60.2 The Extension of the Environment: The English Plural 542

61 Combinatorics and the Plausibility of Universal Grammar 549
  61.1 Power Sets 551
  61.2 Combinatorics of the Universal Segment Inventory 553
    61.2.1 Assuming Two Choices per Feature 553
    61.2.2 Assuming Three Choices per Feature 554
  61.3 Combinatoric Explosion of the Set of Segment Inventories 557
  61.4 Combinatoric Explosion via Rule Syntax 560
  61.5 Combinatoric Explosion of the Lexicon 561
  61.6 Cellular Automata Illustration of Tone Combinatorics 562
  61.7 The Bright Side of Combinatoric Explosion 565
  Exercises 567

62 Postscript 569
  Exercises 571

Bibliography 573

Index 583