Introduction

1. Overview

This is a textbook intended for an introductory course in phonology. The central goal of such a course, we believe, should be the development of students' abilities to analyze sound patterns in natural languages, hence the title, *Analyzing Sound Patterns*. By "analytical abilities," we mean roughly the abilities to: (a) observe, identify, and describe patterns in the data; (b) form hypotheses and construct analyses of the patterns; (c) compare and evaluate competing hypotheses and analyses; (d) develop and evaluate linguistic arguments; and (e) draw conclusions from the analyses and explore their implications. This book is organized around phonological problems and analyses. It is designed to guide students step by step through the analysis, from observation to pattern discovery and from hypothesis formation to analyses and explanations. The book is problem- and analysis-driven rather than concept-driven. It is not organized according to key linguistic and phonological concepts. Key concepts are introduced, but they are embedded in the analyses.

This book consists of six units. They cover six broad areas of phonological study: (a) distribution; (b) alternation; (c) syllable; (d) tone; (e) stress; and (f) prosodic morphology. Unit 1 and Unit 2 focus on two main types of phonological patterns known as distribution (including complementary distribution) and alternation. These patterns are exemplified mostly with data from segmental phonology. These two units introduce a wide range of segmental phenomena from Kikuyu vowel co-occurrence to the distribution of English nasals, and from segment deletion in Tibetan and Tonkawa to assimilatory processes in English and Yawelmani. Starting with Unit 3, the book shifts to suprasegmental phenomena such as syllable, tone, or stress. These units build on earlier themes of distribution and alternation and extend the investigation to processes that affect domains larger than segments. Unit 3 and Unit 4, for instance, open with a chapter on syllable and tonal distribution followed by a chapter that investigates syllable-based and tonal alternations. These chapters not only reinforce the understanding of distribution and alternation but also expand it to new phenomena. They also make transparent the relations between segmental and suprasegmental problems.

There are three or four chapters in each unit, all of which focus on one type of phonological phenomenon. Within a unit, the chapters are organized mainly according to the complexity of problems and analyses and/or conceptual relations

between chapters. Take Unit 2, for example, which is concerned with alternation. This unit starts with a chapter concerning nasals in English. The alternation and conditions triggering the alternation are relatively transparent, especially with Unit 1 as background. Then Tibetan numerals are examined and analyzed. At first glance, what types of problems Tibetan numerals represent is not clear. It is not clear that it is an alternation problem, let alone what alternates and what causes the alternation. Only through analyses does the nature of the problem become clear. Tibetan numerals thus pose a bigger analytical challenge. The last two chapters of Unit 2 present even more complex pattern interaction problems in Tonkawa and Yawelmani. Apart from complexity, we consider the relation of chapter content in structuring the chapters in a unit. Earlier chapters generally develop and build the background for subsequent chapters. An obvious example is Unit 5 on stress. As optimal-theoretic treatments of stress are built on constructs such as feet, Metrical Theory (MT) and its treatment of stress are introduced first.

There are twenty-two chapters in this book. Each chapter examines one puzzle or a set of related puzzles. These problems are taken frequently from one language, though some come from two or three languages. Each chapter starts with a puzzle or a set of related puzzles. Apart from providing the relevant background information, the puzzles are introduced without much explanation. The intention is to offer readers an opportunity to inspect the data, make observations and generate a description of the patterns, and start to develop an analysis. To guide the readers in this task, we provide a series of questions right after the puzzles in most chapters. These questions frame the focus of examination and provide hints for the analyses to come. Following the introduction of puzzles, most chapters guide readers through an analytical process that involves two main steps: (a) observation and pattern discovery and (b) analyses and evaluation. The observation-and-pattern-discovery phase demonstrates how to identify patterns and produce a pre-theoretic description of patterns. Following the pattern-discovery phase, we present what linguists call analyses. These analyses entail using a particular theoretical framework such as the rule-based Derivational Theory (DT) or the constraint-based Optimality Theory (OT), formulating rules or constraints, determining rule ordering or constraint ranking and exemplifying analyses with derivations or tableaux, etc. Earlier chapters of the book place greater emphasis on elaborating the observation-and-pattern-discovery step. As the book unfolds, the emphasis is shifted increasingly to the analyses-and-evaluation phase. Most chapters present and compare at least two competing analyses of the same data. These comparisons illustrate how competing analyses are assessed and on what arguments, as well as uncover the thinking and reasoning behind the evolution of new theories such as OT.

As this book develops students' abilities to analyze phonological phenomena, it addresses topics, concepts, and theories best exemplified by the selected data. This focus restricts the coverage of the book to some extent. It is important to stress that this book does not pretend to address all of the important topics, issues, and theories in phonology. Nor do we believe that it should, considering that it is an

introductory textbook. Nevertheless, the attempt is made to introduce a wide variety of phenomena from a diverse range of language families. As a result, this book covers a broad set of issues, concepts, and theories including, for example, underlying vs. surface representation, rules and rule ordering, natural classes and distinctive features, rule-based and templatic theories of syllabification, Contrastive Specification vs. Radical Underspecification, Autosegmental Theory, MT, OT, etc. The book is divided roughly into two parts with respect to the discussion of theoretical frameworks. The first part, which spans Chapter 1 to Chapter 10, is devoted to derivational approaches to phonological problems. We start introducing OT in Chapter 11, though not every chapter following Chapter 10 presents the OT perspectives. The discussion of OT is postponed to the midpoint for a specific reason. Although OT represents a radical departure from DT, it is developed from and built upon many of the assumptions, claims, and conclusions of DT. For this reason, it is essential that students understand the derivational approaches and associated concepts, assumptions, and claims first. This understanding provides the background and lays the foundation for optimal-theoretic analyses in the second half of the book.

2. Suggestions for the instructor

This textbook adopts a unit-and-chapter organization for three reasons. First, this structure makes it possible for each chapter to concentrate on a specific problem or set of related problems. By organizing related chapters into one unit, this structure ties together the chapters with a shared focus. Second, since each unit consists of three or four chapters, we are able to limit the chapter coverage and reduce the chapter size to an average of fifteen pages. Academic texts are known to be hard for undergraduate students to read and comprehend. Linguistics texts that present analyses are arguably even more challenging. The shorter chapter length makes the reading of a chapter less daunting and encourages the students to read. Third, this structure offers flexibility for the instructor to select what chapters to assign as readings and what chapters to present and discuss in class.

There are twenty-two chapters in this book. It is unlikely that there is sufficient time to cover all twenty-two chapters in an average course. The large number of chapters is intended to offer breadth and variety in coverage. They do not all have to be discussed in equal depth in class. Instructors should consider discussing some chapters in detail, highlighting key issues in others and assigning remaining chapters as readings or the topics for student presentations. For instance, Unit 5 includes three chapters on stress. The first chapter introduces stress from three languages and presents MT and metrical accounts of stress. The second chapter presents optimal-theoretic analyses of the same data. For undergraduates newly introduced to the phenomenon, it is crucial that these two chapters be discussed and understood. The third chapter on stress–epenthesis interactions can be assigned as a reading or a topic for students to present.

In presenting the content of a chapter, we recommend starting the class by asking students to examine the data in section 2. For students newly exposed to language data and analyses, this is not necessarily an easy task. This is why a series of guiding questions is presented to frame the discussion and guide students in observation and pattern discovery. The instructor may introduce these questions orally or ask students to read them in the textbook. Then the instructor can give students five to ten minutes to work in a group, asking them to examine the data, make observations, and identify the patterns. Once students have a chance to look at and discuss the data, the instructor may take over and lead a class discussion. In conducting this class discussion, the instructor can use the questions to elicit student responses and lead the students to pattern discovery.

When students are first introduced to a phonological phenomenon, they are unlikely to be familiar with the concepts and theories used in the analyses. Thus it may be necessary to introduce these concepts and theories before presenting the analyses. For instance, when students are first introduced to the generative analysis, the concepts of underlying vs. surface representation and rules need to be discussed. Of course, as students become more familiar with these concepts, they can be quickly reviewed or skipped over. Once students have the background, the instructor can then demonstrate how the patterns can be analyzed. As the goal is to develop students' analytic abilities, it is important to involve students in every step of the analyses. The instructor can encourage student participation with leading questions and help them, if possible, to arrive at the analysis or at least part of an analysis.

This book offers four types of exercises: (a) discussion/reading response questions; (b) multiple-choice questions; (c) fill-in-the-blank questions; and (d) problems for analyses. They are designed to encourage the students to read the book, test the proposed analyses, and engage in pattern discovery and analyses. Each chapter is equipped with two to three discussion/reading response questions concerned with the core issues of a chapter. These questions can be used to frame the group and class discussions or they can be assigned as the questions for students to write about. We have had the experience of assigning these questions as the topics for students to develop what we call a reading response. Students are asked to select one question and write a short reading response. The response is limited to one single-spaced page, making it easy for students to write and for instructors to grade. This assignment offers several benefits. First, because the questions are tied to the chapter, writing a response encourages students not only to read but to read with comprehension. Second, they offer students opportunities to practice writing about linguistic issues. In our experience, students tend to ignore data and make claims and assertions without factual support and examples. The instructor can require students to use facts and examples to make their points in reading responses. Though the responses are limited in scope, they offer students some practice to address linguistic issues in writing and lay the foundation for students to report solutions to complex problems in writing. Third, the responses provide insights into student thinking and pinpoint areas of

difficulty for the instructor. For your information, Appendix A provides a copy of instructions to the Reading response assignment we used. Instructors can request a sample student response directly from the author.

In addition to discussion questions, we have prepared a series of ten questions that students can do quickly for each chapter. These questions take two main forms: (a) multiple-choice and (b) fill-in-the-blank. Multiple-choice questions take mostly the following format. They may focus on the existing data from the chapters or introduce additional data. Questions may ask students to examine the data and engage in a variety of analytical tasks such as identifying patterns, evaluating competing statements of generalizations, determining representations and/or rules, assessing competing derivations, etc. Depending on the questions, the choices (four to six) may spell out different statements of patterns, competing underlying representations and rule formulations, alternative derivations, etc. Because answers are provided in the form of choices, multiple-choice questions are generally easier than fill-in-the-blank questions. It is important to point out that there might be more than one correct choice to some questions. Students should be advised to select the best of all choices. Fill-in-the-blank questions take many forms. In some, students may be asked to supply part of or a complete derivation or tableau. In others, they may be required to state a generalization, a rule, or a constraint. Apart from these ten questions, selected chapters provide five or ten additional multiple-choice or fill-in-the-blank questions related to a problem for analyses. These questions are designed to provide additional support and guide the students to the solution to that problem.

Most multiple-choice and fill-in-the-blank questions are tied directly to the chapters and encourage students to read and re-read the chapters. For this reason, in the instructions to these questions, references are made frequently to specific sections or numbered items in the chapters. Students should be urged to review the relevant sections before and while attempting to answer these questions. These questions also encourage students to test proposed analyses and develop the habit of checking and questioning linguistic analyses. The instructor may use these questions in a variety of ways. He or she may decide to pause in the middle of or at the end of a discussion and ask students to do a couple of these questions in class (individually or in pairs). Students may shout out their responses or use clickers to register their responses. An advantage of these questions is that they are specific and target areas that are important and challenging. Thus, student responses can be used to gauge understanding and determine the areas to be emphasized. Multiple-choice or fill-in-the-blank questions can be administered as an in-class quiz. We normally allocate ten to fifteen minutes to each in-class quiz consisting of five or six items. They may also be assigned as a take-home quiz. We find that take-home quizzes encourage students to revisit the chapter and/or to discuss and debate the responses with their classmates, activities that can solidify their grasp of concepts and analyses.

The fourth type of exercises is the more familiar phonological problems, found in most phonology textbooks. These problems generally present data from a new language. Students are asked to examine the data, identify the patterns, formulate

an analysis using a particular theoretical framework, and report the analysis in writing. These problems are more demanding because they require students to tap into and integrate a variety of analytical and writing skills. In assigning phonological problems, the instructor should spell out the expectations and requirements carefully. We have tried to provide more explicit instructions for the analytical problems, but due to space constraints, these instructions cannot be even more explicit. We urge the instructor to develop his or her own instructions for the problems. In the instructions, it is important to spell out the content as well as the writing expectations for the written analyses. We have also found it helpful to explain and discuss the written instructions orally. This is particularly important when students are first presented with the task of problem solving and analysis. In Appendix B, we provide for your reference an example of instructions for a problem that lay out both the content and the writing requirements more explicitly.

Apart from providing and explaining written instructions to phonological problems, we find it necessary to take some class time and discuss model responses of phonological analyses once students have had a chance to tackle one or two problems on their own. We generally take the best student response and rewrite it to reflect the content and linguistic features desired. We then have students read the sample analysis in class and identify and discuss the features that are useful to them as readers. Discussing model analyses helps students visualize what is expected and deepens their understanding of the content and writing expectations in linguistics. Instructors may request a sample written analysis from the author.

The four types of exercises are designed to offer breadth and variety. Some exercises emphasize reading and understanding. Some target specific aspects of linguistic analyses and develop students' understanding and these aspects of their analytical skills. Some require analyses and syntheses. Together, they provide, we hope, more opportunities for more students to engage with the book and with linguistic analysis.

3. Recommendations for the student

The aim of this book is to develop your ability to analyze sound patterns in natural languages. While it is important to understand concepts, analyses, and theories, comprehension alone is not sufficient. It is imperative that you apply this understanding to solving phonological problems. For this reason, the book goes to great lengths to demonstrate competing analyses of problems. For the same reason, we provide a variety of exercises to encourage you to read and re-read the book, to apply selected concepts in analyses, to test the analyses with new data, and to engage in problem solving and analyses. This is not an aim you can achieve by reading or rote memorization. You must involve yourself in analyses – "get your hands dirty," so to speak.

There are many ways to be involved. For instance, once you finish reading section 2 of a chapter, pause and use the guiding questions to examine the data, make observations, and identify some of the patterns in the data before proceeding to the analysis section. It is not important that you develop a full-fledged account, but it is essential that you try. Such efforts can help you anticipate the analyses, deepen your understanding, and develop the habits crucial to linguistic analysis. Second, while reading, say, the section that guides you to the patterns in the data, ask yourself about whether the identified pattern applies to other forms or what predictions it makes for them. If a particular form appears to be an exception, try modifying or rewriting the statement so that the generalization encompasses the additional forms. In reading the analysis section, test the analysis with data not exemplified in the book. Try writing a rule or constructing derivations or tableaux yourself. Third, whether you are required to or not, do the multiple-choice or fill-in-the-blank questions while or after reading a chapter. These questions are designed to test your understanding of the presented analyses and try them out. The key point is that you cannot just read the book, even though this is important. You need to interact with it. You need to learn to analyze problems by analyzing them. Direct involvement in analyses can strengthen your understanding and cultivate your ability to think, analyze, and reason.

UNIT 1

Distribution

This unit is concerned with the problems of distribution. Distributional problems arise from restrictions imposed on the co-occurrence of sounds or on the co-occurrence of sounds with structural positions. This unit focuses on the distribution of sound segments. Distributional problems concerning suprasegmental phenomena such as syllable, tone, and stress will be discussed in Units 3–5. This unit includes four chapters. Chapter 1 is concerned with vowel co-occurrence in Kikuyu, which shows that Kikuyu vowels cannot freely combine in verb roots. This chapter introduces the concept of pattern and related concepts. Chapter 2 continues the exploration of distribution by showing that consonants are subject to co-occurrence restrictions. We show that English nasal consonants exhibit co-occurrence restrictions with following consonants and with certain structural positions. Chapter 3 shifts the focus and examines a sub-type of distributional phenomena, problems referred to as complementary distribution. Complementary distribution is a type of distribution which concerns the relations of sounds. In problems of complementary distribution, not only are sounds restricted, but restrictions on some sounds are opposite to the restrictions on other sounds. By showcasing a relatively simple example of complementary distribution involving Luganda liquids, this chapter demonstrates not only how to identify such restrictions, but also how to analyze them. Chapter 4 presents a more complex type of complementary distribution involving Thai plosives. This chapter strengthens your understanding of both complementarity and contrast as concepts of sound relations. These four chapters, together with accompanying exercises, present a variety of segment-related distributional problems and introduce a range of phonological concepts, concepts such as phoneme versus allophone, underlying versus surface representation, natural classes and distinctive features.