

The Theory of Lexical Phonology

K. P. Mohanan

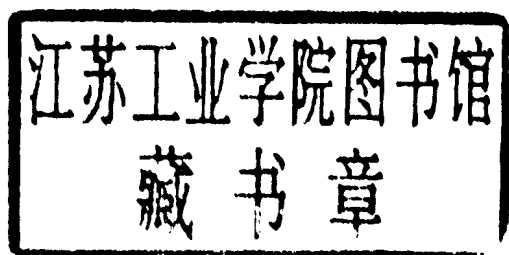


Studies in Natural Language & Linguistic Theory

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PREFACE

This book contains some of the material which originally appeared in my Ph.D. thesis *Lexical Phonology*, submitted at the Massachusetts Institute of Technology, but it can hardly be called a revised version of the thesis. The theory that I propose here is in many ways radically different from the one that I proposed in the thesis, and there is a great deal of new data and analyses from English and Malayalam. Chapter VI is so new that I haven't even had the time to try it out on my friends.

As everyone knows, research is a collective enterprise, even though an individual's name appears on the first page of the book or article. I would think of this book as a joint project involving dozens of people, in which I acted as the project coordinator, collecting suggestions from a wide variety of sources. Four major influences on what the book contains were Morris Halle, Paul Kiparsky, Mark Liberman, and Joan Bresnan. I learned the ropes of doing research on phonology, phonetics, and morphology from them, and almost everything that I discuss in this book owes its shape ultimately to one of them. Among the others who contributed generously to this book are: Jay Keyser, James Harris, Douglas Pulleyblank, Diana Archangeli, Donca Steriade, Elizabeth Selkirk, Francois Dell, Noam Chomsky, Philip Lesourd, Mohammed Guerssel, Michel Kenstovicz, Raj Singh, Will Leben, Joe Perkell, Victor Zue, Paroo Nihalani, P. Madhavan, and Stephanie Shattuck-Hafnagel. I have also benefited a great deal from the discussions that followed the talks I gave on Lexical Phonology at the University of Texas at Austin, Cornell University, Stanford University, and the Australian Linguistics Association. The courses on introductory phonology that I gave at the National University of Singapore brought me a great deal of juicy data from English, and taught me how to present Lexical Phonology to those who are not already working within the theory.

Two anonymous reviewers read my Ph.D. thesis very carefully, and made a number of valuable suggestions, most of which have been incorporated into the book. This book would have been very much poorer but for the extensive and insightful comments from Frank Heny. Mangesh Nadkarni crystallized for me the intuitive significance of what I was trying to say, helping me to make the book accessible, I hope, to non-MIT readers. Emily Rando did a superb job of converting the manuscript into clear prose.

My wife, Tara, the unacknowledged coauthor, supervisor, and copy editor of all my work in linguistics, converted a total mess into a book in the course of several cycles of discussion and editing. While we were going

through the labour pains of the book, our daughter Malavika patiently left us to do our work, playing by herself in a corner of the room.

If there are any errors or weaknesses in this book, they are entirely unintentional, and no one, not even any of my teachers, is to be held responsible.

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CHAPTER I

INTRODUCTION

If I have seen farther than others, it has been by standing
on the shoulders of giants.

Sir Isaac Newton

1.1. THE ISSUES

In many ways, the theory of generative phonology launched by Chomsky & Halle (1968) (= SPE) is a continuation, not a total rejection, of some of the central concerns of the classical phonemic theory that preceded it. The SPE theory stood firmly on the foundations built by its predecessor: both assumed the need for a phonetic representation in terms of strings of segments which abstracted away the linguistically irrelevant properties of speech; both premised a more abstract representation, namely, a phonemic or underlying representation, in order to capture the regularities of phonetic representations; and both attempted to encode certain kinds of morphological information, required by the phonological rules, in terms of juncture symbols like + and #. The principal divergence between the two approaches lay in the answer to the question: what are the levels of representation in phonological theory? The answer that classical phonemic theory yielded was that there are three levels: phonetic, phonemic and morphophonemic.¹ SPE abandoned the intermediate level, its (systematic) phonemic level approximating the morphophonemic level of the earlier theory.

The first phase in the history of generative phonology, which I shall refer to as the SPE THEORY, was characterized by a preoccupation with the RULE SYSTEM. Research during this period was concerned with extrinsic and intrinsic rule ordering, cyclic and noncyclic rules, iterative application, and various formal notations for the statement of phonological rules. This period also saw some interest in the classification of rules into rule types, such as phonetic, phonological and morphophonemic rules (e.g. Anderson (1975)), processes and rules (Stampe (1973)), P-rules, MP-rules, and via rules (Venneman (1971), Hooper (1976)), etc. This interest stemmed partly from the feeling that there was some intuitive justification for the distinction between allophonic rules and morphophonemic rules made in classical phonemic theory. In spite of this vague feeling of uneasiness, which never completely dissipated, we recognize that SPE, using some of the conceptual apparatus inherited from its predecessors, took a revolutionary step forward in understanding the nature of the sound systems of natural languages.

Further advances in phonological theory have, as their basis, the knowledge and experience accumulated by SPE as well as classical phonemics. The second phase in generative phonology saw a shift of focus from rule systems to the NATURE OF PHONOLOGICAL REPRESENTATIONS. SPE theory, like Bloomfieldian phonology, had assumed that the representations which served as the input and output of phonological rules were essentially strings of segmental symbols. The first break from this tradition came from the study of three types of phenomena: syllable structure, stress, and tone, all of them leading to a richer conception of phonological representations. Kahn (1976) reintroduced into phonology a notion that classical phonemicists outside the strict Bloomfieldian tradition had used, namely, the notion of the syllable as a grouping of segments (Pike 1947, Abercrombie 1967). The notion FOOT, which had intuitive status in classical phonemics (Abercrombie 1967), was made available as a formal construct in phonological theory by Liberman (1975) and Liberman & Prince (1977), who proposed that the rules governing stress and intonation could be stated better in terms of representations in which syllables were grouped together in hierarchical structures called 'feet'. The proposals made by Kahn and Liberman led to the birth of METRICAL PHONOLOGY (Halle & Vergnaud 1978, McCarthy 1979, Hayes 1980, and others). Simultaneously, the proposals in Williams (1971), Leben (1973) and Goldsmith (1976) gave rise to AUTOSEGMENTAL PHONOLOGY, which makes available to phonological theory the Firthian intuition that in addition to sequences of entities at the level of segments (phonematic units), phonological theory must also recognize strings of entities on a parallel level (prosodic units) (Firth 1957). Autosegmental theory introduced a formal way of relating these two "tiers" of representations, namely, the segmental units and the autosegmental units of tone (or other phonological features), in terms of "association conventions" that "link" the entities on the two tiers (see Pulleyblank (1983)). These two theories, the domains of which overlap, come under the label of NONLINEAR PHONOLOGY.

The developments in nonlinear phonology did not negate SPE phonology: they added a new dimension to it, and made the necessary modifications called for by this dimension. The third phase in generative phonology added yet another dimension on the foundations built by SPE and nonlinear phonology. I would like to characterize this phase as a preoccupation with the INTERACTION BETWEEN THE PHONOLOGICAL RULE SYSTEM AND OTHER MODULES OF THE GRAMMAR. The seeds of this phase were sown when Siegel (1974) proposed that the morphological module of the grammar consisted of ordered submodules called "levels", and that the cyclic rules of word stress in English applied within one of these modules, after every affixation. Siegel was, in fact, anticipated by Bresnan (1971) who proposed that the Nuclear Stress Rule of SPE should

be allowed to apply in every syntactic cycle. Pesetsky (1979) developed these ideas to include other types of cyclic rules, and provided a way of accessing morphological information by the phonological rule system without having recourse to boundary symbols like + and #. These studies led to the birth of LEXICAL PHONOLOGY in Mohanan (1982) and Kiparsky (1982), which have been followed by a number of studies proposing applications, modifications, and extensions (Pulleyblank 1983, Kiparsky 1983, 1984, Church 1983, Withgott 1982, Archangeli 1984, Liberman 1983, Mohanan & Mohanan 1984, Halle & Mohanan 1985, and others).

This book is an attempt to present a fully worked out theory of Lexical Phonology on the basis of a detailed examination of two languages, namely, English and Malayalam, validating the fundamental assumptions common to all versions of Lexical Phonology, and choosing between alternative assumptions available within the overall framework of Lexical Phonology. In particular, I shall be concerned with the following questions:

- A. What is the nature of the modular organization of morphology?
- B. How does the phonological module interact with the submodules of morphology?
- C. What are the levels of representation yielded by the interaction between phonological and nonphonological modules in Lexical Phonology, and how significant are these representations?
- D. What is the nature of the output of phonology (i.e., phonetic representations), and what kinds of mechanisms do we need to yield this output?

Some of the answers to these questions will turn out to be surprisingly close to the answers given by the classical phonemic theory. Like classical phonemics, Lexical Phonology recognizes a level of representation intermediate between the underlying/morphophonemic and the phonetic. Like classical phonemics, Lexical Phonology incorporates a module of phonological rule application that yields "allophonic" processes not having access to nonphonological information. And Lexical Phonology yields an inventory of phonological segments like the phonemes of classical phonemics that plays a significant role in the conscious operations of language users. Knowledge often progresses in a spiral, turning a full circle, but never going back to the same point.

1.2. THE HISTORICAL PERSPECTIVE

The early stages of generative linguistics had no provision for morphology. The grammar was conceived of as a device that maps a set of morphemes directly onto a set of sentences (Chomsky 1957, 1965). The traditional notion WORD played no role in linguistic theory, except as an accidental stage in the derivation of the sentence. The basic assumption was that the

way morphemes were put together to form words was not distinct from the way words were put together to form sentences. Consequently, word structure and sentence structure were handled by the same module of the grammar. Thus, the transformational component both attached *-ment* to *develop* to form *development*, and moved the Aux to the front in *Is John going?*

During this period, the lexicon was viewed as an unstructured collection of whatever was idiosyncratic and unpredictable. All phenomena which were regular and worthy of the linguist's attention were the burden of the nonlexical components — syntax, phonology and semantics — and little attention was paid to the nature of the lexicon.

It was this organization of the grammar that lay behind the phonological theory in SPE. Since the Standard Theory of syntax did not distinguish between morphology and syntax, the Standard Theory of phonology did not distinguish between phonological alternations which were conditioned by morphology, and those which were independent of it.

With Chomsky's seminal paper, 'Remarks on Nominalization' (1970), the traditional notion 'word' was reintroduced into generative linguistics. Chomsky proposed that certain regular relationships between words could be expressed in terms of "lexical rules", and that these rules were different in nature from the syntactic rules which determined sentence structure. A lexical rule was a "redundancy" rule which captured the regularities in the lexical entries, such as the relation between *destroy* and *destruction*. This was the beginning of the recognition that word structure and sentence structure were not governed by the same set of principles, and that they belonged to different modules of the grammar. In Chomsky (1965), the output of the lexicon was a set of morphemes; after Chomsky (1970), the output of the lexicon was a set of words.

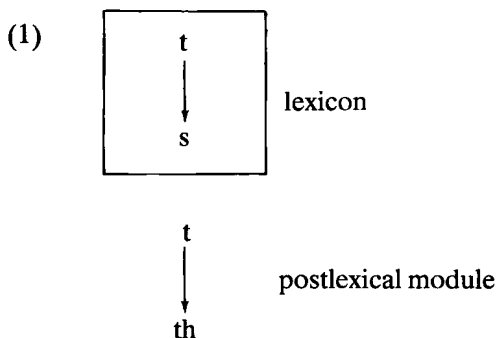
The second significant work on this development was Halle's 'Prolegomena to a Theory of Word Formation' (1973). Halle undertook to investigate the principles governing word structure in depth, and added a new module to the grammar as part of the lexicon, namely, the word formation component. Thus, Chomsky (1970) and Halle (1973) attributed a richer structure to the lexicon, and directed researchers' attention to the nature of lexical operations. Ever since, there has been an increasing awareness of the role of the lexicon in linguistic theory. Halle was followed by several linguists who studied the organization of the lexicon and the rules which characterized word structure: Aronoff (1976), Siegel (1974), Jackendoff (1975), Allen (1978), Hust (1978), Amritavalli (1980), Lieber (1980), and Selkirk (1983), to mention a few. Several linguists recognized that the mechanism of lexical rules could be extended to handle phenomena which were previously handled within the module of syntax, such as Dative Movement, Passivisation and Raising (Bresnan 1978, Baker 1979). Others argued that in addition to derivational morphology, inflec-

tional morphology should also be assigned to the module of the lexicon (Lieber 1980). As a result, the lexicon and the lexical rules came to be regarded as the appropriate device for expressing the characterization of a great number of syntactic (and semantic) regularities, thereby considerably reducing the power of the nonlexical syntactic module.

It was at the beginning of this intellectual movement in favour of enriching the lexicon that Seigel (1974) made the radical suggestion that the lexicon could be used to express certain phonological processes as well. This suggestion was pursued by Pesetsky (1979) who demonstrated that it could be exploited fruitfully to deal with the problems associated with cyclicity. Pesetsky was followed by Mohanan (1982) and Kiparsky (1982), who developed two slightly different models of Lexical Phonology. What was common to the different versions was the idea of having both lexical and postlexical applications of phonological rules, mirroring the dichotomy between word structure and sentence structure. The theory of Lexical Phonology, therefore, may be viewed as an extension of the lexicalist trend in syntax and morphology to phonology as well — as a logical step in the course of developments sparked off by Chomsky's 'Remarks' (1970).

1.3. THE SPIRAL OF PROGRESS

At the root of Lexical Phonology as presented in this book is the recognition that an alternation like [t]/[s] in *president* [prezɪdənt]/*presidency* [prezɪdɛnsɪ] is different in nature from an alternation like [t]/[θ] in *photograph* [fəʊtəɡrəf]/*photographer* [fəʊtəɡrəfər]. The theory distinguishes between them by saying that the rule that changes /t/ to [s] applies in the lexicon, while the rule that changes /t/ to [θ] applies outside the lexicon or postlexically:



In the theories of phonology that made use of the classical phonemic level of representation, the intuition about the two kinds of pro-

during this period that the principles of phonemic analysis that defined the relation between phonetic representations and phonemic representations led to unacceptable phonemic representations. For example, the classical phonemic principle of contrastive distribution forced the conclusion that the [e·] in *bedding* [be·DIŋ] and the [e] in *betting* [beDIŋ] were distinct phonemes in American English (Chomsky 1964). This analysis (a) is counterintuitive, as speakers do not consider [e·] and [e] to be distinct sounds, and (b) it adds unnecessary complexity to the grammar since [e] never occurs before voiced sounds except [D], and [e·] never occurs before voiceless sounds. What carried conviction in such arguments was speaker intuitions, rather than the relative complexity of the grammars.

A great deal of research in generative phonology after 1968 rebelled against the 'abstractness' of SPE, which rejected the 'concrete' level of the intuitively apprehended level of phonological representation. Natural Phonology (Stampe 1973), Natural Generative Phonology (Hooper 1976), Upside Down Phonology (Leben & Robinson 1977), etc., belong to this rebellion.

What crucially distinguishes Lexical Phonology from the previous theories of 'concrete' phonology are two features. Firstly, it recognises two types of rule *applications*, instead of two types of rules. Rule applications are distinguished in terms of the MODULE in which they apply. A rule may apply in the lexical module, the postlexical module, or in both. The application in the lexical module is the lexical rule application, while the application in the postlexical module is the postlexical rule application, but there is no distinction between lexical rules and postlexical rules, as the same rule may apply in both. The change from /s/ to [š], for example, takes place in the lexicon in the word *racial* (cf. *race*), but it takes place in the postlexical module in *I mi[š] you* (Halle & Mohanan 1985). Secondly, there is no requirement that all postlexical rule applications be allophonic: the homorganic nasal assimilation in both *ten things* and *ten pounds*, for example, take place in the postlexical module.

Lexical Phonology tries to regain what was intuitively true about the classical phonemic representation. In fact, one may even say that Lexical Phonology achieves what classical phonemics failed to do, namely, to make sense of the intuition in terms of a formal theory. It may therefore be claimed that Lexical Phonology is the true heir of the legacies of classical phonemics as well as SPE phonology.

NOTES

¹ Even though the idea of discovery procedures made the level of morphophonemic representation an embarrassment in American Structural Linguistics, the descriptions of classical phonemicists, including those of structuralists, incorporated this level (e.g. Bloomfield (1939)).

² Jones (1940), for example, refers to the phonological process in *ten things* as "similitude" and that in *ten pounds* as "assimilation".

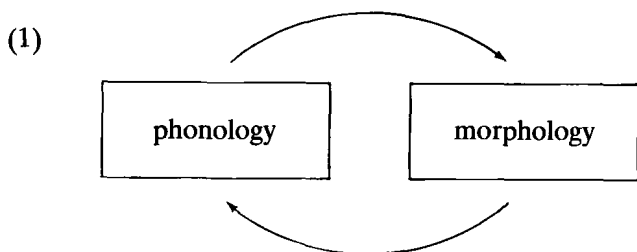
CHAPTER II

AN OUTLINE OF THE THEORY: ENGLISH PHONOLOGY

2.1. LEXICAL AND POSTLEXICAL RULE APPLICATIONS

2.1.1. *Two Criteria*

At the heart of Lexical Phonology (as stated in the previous chapter), is the idea that a subset of phonological rule applications takes place in the lexicon, in tandem with the morphological operations, and another subset takes place postlexically. The output of phonological operations may undergo morphological operations, and may then undergo further phonological operations. Phonology and morphology, in other words, are inputs to each other in this model:



How do we distinguish between lexical and postlexical rule applications? In Pesetsky (1979) (as well as in Kiparsky (1982)), the distinguishing feature is cyclicity: lexical rules (i.e., those which apply in the lexicon) are those which apply cyclically; noncyclic rules are postlexical. Following Mohanan (1982), I shall take a different tack, and use sensitivity to morphological information as the main distinguishing feature. Morphological information includes the presence or absence of morphological breaks between constituents (encoded in SPE in terms of boundaries), morphological features like [Latinate], exception features, etc. Operations which are sensitive to morphological information are those which require, or are blocked by, the presence of these features in the string. For example, the application of Trisyllabic Shortening in English requires morphological information, as it applies across + but not across #: it applies in *divin+ity* but not in *maiden#hood*. The same is true of the application of Velar Softening, as it applies only in the Latinate vocabulary: it applies in *receive*, but not in *king*. In contrast, the applica-